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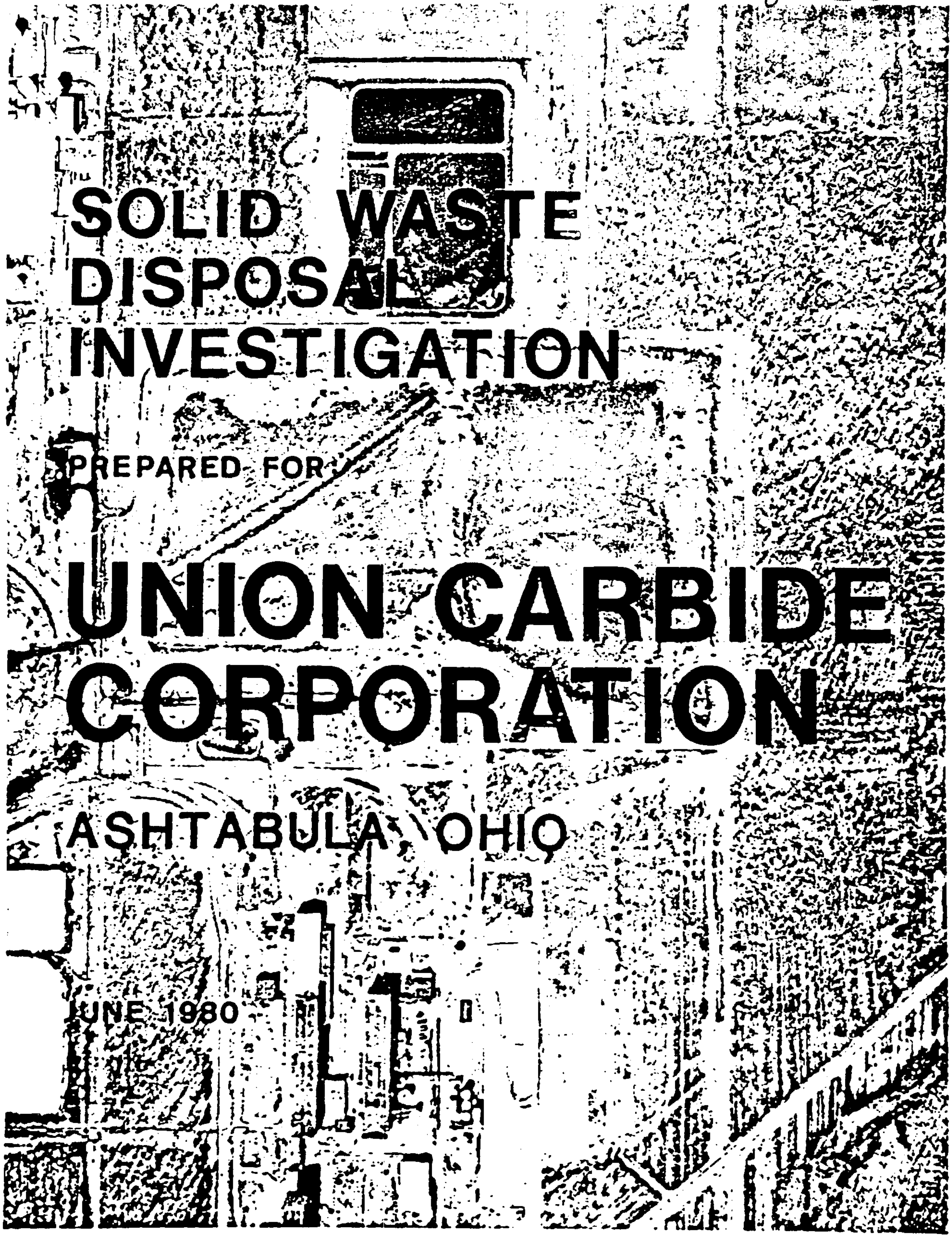

SOLID WASTE DISPOSAL INVESTIGATION

PREPARED FOR:

UNION CARBIDE CORPORATION

ASHTABULA, OHIO

JUNE 1980

PREPARED BY:

ENGINEERING-SCIENCE

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SOLID WASTE DISPOSAL INVESTIGATION

UNION CARBIDE CORPORATION

Ashtabula, Ohio

May 1980

ENGINEERING-SCIENCE, LTD.
Cleveland, Ohio

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REPORT ORGANIZATION

This report is organized into five sections. Section 1 describes the need for the study. This section is followed by a description of the disposal site and a characterization of waste products in Section 2. The third section provides a brief Executive Summary outlining the more salient findings and recommendations resulting from the study. Section 4 describes research methods and results. The fifth and final section presents a more detailed discussion of findings and recommendations. Following Section 5 are Tables, Figures and an Appendix. Included in the tables are the results of chemical analyses of groundwater samples.

STUDY TO DEVELOP BOTH SHORT AND LONG TERM SOLID WASTE DISPOSAL MANAGEMENT PLANS FOR THE UNION CARBIDE CORPORATION ASHTABULA, OHIO COMPLEX

1. INTRODUCTION

1.1. Background

In June of 1979 the Ohio Environmental Protection Agency (Ohio EPA) contacted the Union Carbide Corporation (UCC) regarding the solid waste disposal practices at their Ashtabula, Ohio Industrial Complex. This complex includes three facilities: the UCC Metals Division, the Linde Welding Products Division and the Linde Air Products Division. All three of these divisions generate wastes which are disposed both on and off site.

The Ohio EPA informed UCC that under the Ohio Revised Code, Section 3734 and under the Ohio EPA Regulations, published in Section 3745-27 of the Ohio Administrative Code, the Corporation is required to submit a Solid Waste Disposal Facility Plan for the Ashtabula complex for state approval. Later Ohio EPA conducted a site visit of the Ashtabula complex and reported that the disposal area was in a state of disarray.

In response to the State of Ohio requirements, Union Carbide contracted with Engineering-Science, Ltd. (ES) to investigate the Ashtabula Complex's current solid waste disposal practices and to develop a short and long term management plan which will satisfy Ohio's environmental requirements.

Engineering-Science is also tracking the development of the U.S. EPA's Resource Conservation and Recovery Act (RCRA) requirements and is considering both effective and potential federal regulations in the development of the disposal plan for Union Carbide. While the final RCRA regulations have yet to be published, it is anticipated that they will not differ significantly from the State of Ohio requirements on most major issues.

This report presents Engineering-Science's analysis of the facility's operation based on extensive tests and examinations, all described herein. The thrust of this work has been related to groundwater quality and management. This document provides Union Carbide with a detailed program for resolving both short term and long term waste disposal questions for the Ashtabula complex and constitutes a facility plan conforming to Ohio regulations.

2. HISTORY OF THE SITE

Union Carbide Corporation has operated an industrial complex on a 673 acre site located in Ashtabula Township, Ashtabula County, Ohio since World War II. The site is roughly bordered by Lake Erie on the north, State Road on the west, Middle Road on the south, and the extension of Cook Road on the east (see Figure 1). Three divisions of Union Carbide have facilities located at this site, the Metals Division which manufactures ferro alloys, calcium carbide and lime; the Linde Air Products Division which operates a tonnage air reduction plant; and the Linde Welding Products Division which manufactures welding wire.

Most of the liquid and solid wastes generated by on-site operations have been handled on-site. Over the years sludge ponds (see Figure 2) have been developed for disposal of solid and semi-solid wastes. These ponds also contain solids removed from the wastewater treatment systems, as well as a variety of other waste materials generated by the plant's operation over the years.

2.1. Present Disposal Practices

Of the five ponds shown on the map (Figure 2), three have been abandoned as active waste disposal areas. These abandoned ponds are

Ponds 1, 1a, and 2. Thus, Ponds 3 and 3A receive all solid waste materials which are disposed on site from all three facilities.

The Union Carbide Metals Division generates about 30,000 tons of wastewater treatment sludge, metal shot and waste paper annually. About 95 percent of this material is sludge and is deposited in Pond 3A. The remainder of the Metals Division solid waste is deposited in Pond 3.

Each year the Linde Gas and Linde Welding Products Division together generate about 1,000 tons of scrap paper, wire, and mill scale. All of this waste material is deposited in Pond 3. The estimated weight and volume of the various materials generated by each operation is presented in Tables 1 and 2. The composition of the sludge produced by the Metals Division Wastewater Treatment System and the Linde Welding Products Division is presented in Table 3. Most of these materials, with the exception of the waste oils, are currently landfilled on-site. With the exception of PCB containing oils, which are disposed at an approved PCB site, waste oils are hauled off-site for recycling.

The general on-site disposal strategy involves two workers who collect and dump all materials into the ponds in a random fashion employing bulldozers and dump trucks. The various component wastes are neither systematically segregated, compacted, or covered.

3. EXECUTIVE SUMMARY: FINDINGS AND RECOMMENDATIONS

3.1. Findings

The State of Ohio requirements specify that a groundwater characterization study be conducted in conjunction with the development of a Solid Waste Disposal Facility Plan. In the process of performing this groundwater study Engineering-Science has discovered that the Ashtabula Industrial Complex has a groundwater contamination problem in addition to its violation of aesthetics standards. As would be expected, the nature and magnitude of this problem will have a significant influence on efforts to develop an effective short and long term management strategy.

The groundwater quality problem appears to be confined to the upper saturated zone where concentrations of ammonia were found to be significantly higher than the Public Water Supply Water Quality Standards.

The data indicate that leachate from the materials disposed in UCC Ponds 3 and 3a is migrating through the containment dike into the groundwater. Our analysis of the operation suggests that if the ponds are not unmodified, leaching will continue for many years, even if the ponds are closed. For this reason we consider the groundwater contamination issue to be a focal point of the long range solid waste management plan. The problem is discussed in more detail in Section 4 of this report.

3.2. Recommendations

The following list of recommendations summarizes key facets of the short term management plan. These issues are presented in more detail in Section 5 of this report.

- Continue using Pond 3a exclusively for disposal of Metals Division Wastewater Treatment Sludge.
- Segregate non-hazardous wastes.
- Convert and manage Pond 3 as a landfill for non-hazardous wastes rather than as an open dump.
- Dispose of Linde Welding Products Wastewater Treatment Sludge and UCC Metals Division wastes separately from one another.
- Dispose metal shot daily if possible.
- Arrange to handle combustibles off-site.
- Implement a variety of "housekeeping" measures to improve aesthetics of the site.

4. RESEARCH METHODS AND RESULTS

Engineering-Science's approach to this groundwater analysis and facility planning exercise involved three basic components: a geological component, a hydrologic component, and the chemical analysis of groundwater samples. The approach to the geologic and hydrologic studies and the results of these studies and the chemical analyses are discussed in this section. The methods used in the chemical analyses are standardized and for this reason only the results (and not the methods) of chemical analyses are provided herein.

4.1. Geologic and Hydrologic Investigations: Methods

Engineering-Science's subcontractor, Herron Consultants, Inc., of Cleveland, Ohio drilled a total of six (6) test borings to gather data necessary for the evaluation of the hydrogeologic conditions in the vicinity of the disposal ponds. The locations of these test wells are noted on Figure 3. These six (6) wells are the only existing active groundwater wells in the entire vicinity. Ohio regulations require an inventory of water supply wells within 2,000 ft of the solid waste disposal ponds. There were no existing wells located within this limit.

Herron Consultants drilled the six (6) wells using a CME-45 truck mounted rotary drill rig. The borings for the wells were advanced using 7-inch O.D. (outside diameter) hollow flight augers.

To develop as detailed a picture as possible of the subsurface conditions, samples were taken at 2.5 foot intervals in depth using the split spoon sampler. This sampler consists of a 24 inch x 2.5 inch O.D. split steel barrel which was driven 18 inches into the soil at each sample interval using a 140-lb hammer that was dropped 30 inches. Blow count per 6 inches of penetration was recorded with the total blows per last 12 inches of penetration per sample representing the standard penetration or "N" value. This value is used to determine relative density and the soil consistency.

Several undisturbed samples were recovered using the "Shelby" tube sampler. The Shelby tube samplers consist of 30 inch x 3 inch O.D. steel thin wall tubes that were hydraulically pushed 18-24 inches into the soil. The samples lifted were sealed in their tubes and taken to the laboratory of Herron Consultants, Inc., where they were extruded for testing and micro-logging. These samples, as well as some of the split spoon samples, were tested for index properties to classify them according to the Unified Soil Classification System (USCS). The tests performed on the samples included grain size analysis through 2 microns, Atterberg limits (a measure related to soil stability), specific gravity, natural moisture content, unit weight and permeability.

To aid in the determination of the presence of groundwater in the subsurface strata, piezometers were installed in each test boring for each major stratum encountered. The piezometers consist of a 2 inch I.D (inner diameter) Schedule 40 PVC standpipe attached to a 3 ft. x 2 inch I.D. well point with No. 10 slots. The bore hole around the well point was backfilled with ottawa sand to a height of 3-6 feet above the bottom of the hole. Above this, a 1 foot thick bentonite "pi" pellet seal was installed. The rest of the hole was backfilled with drill cuttings and bentonite materials. The top of the standpipe extended about 2 ft above ground to make it clearly visible and to facilitate sampling. A total of six (6) piezometers were installed. After the piezometers were blown out with air, a falling head permeability test was conducted in each piezometer.

The permeability tests were performed by filling the standpipe with water and recording the depth that the water dropped at one (1) minute intervals for 15 minutes. The piezometers were then blown out with air and allowed to stabilize before water samples were taken.

From the resulting data the project team was able to determine the permeability of the various strata.

All of the data generated by the various field and laboratory programs plus data gathered from published literature were synthesized and evaluated to develop the hydrogeology of the solid waste disposal sites. The results of the analysis are presented later in this section.

4.2. Geologic Characterization

The project area is located within the Lake Plain Division of Fenneman's Central Lowlands Physiographic Province. This area is not more than five miles wide at any location. The area is an undulating rough field covered with a thick foliage of grass, leaves and trees. The area's drainage is poor, and the soil type is such that surface ponding is common. Drainage is further reduced by a general lack of topographic features and by subsurface hydrogeologic conditions.

The predominant glacial feature of the area that displays topographic relief is the Portage Escarpment (a terminal moraine of Wisconsin Age) which roughly parallels the Lake Erie shoreline and is five to six miles inland, paralleling U. S. Route 20. This morainal deposit reaches an elevation of 700-800 feet above sea level. It drops off quite rapidly to the northwest and north to the Lake Plain which ranges in elevation from 600-650 feet to an elevation of ± 573 feet at the Lake Erie shoreline. This Lake Plain consists of deposits of wave-washed till, glacial beach deposits and lacustrine soils. The surficial soils (upper 48 inches), according to the United States Geological Survey, belongs to the Conneaut-Swanton-Claverack soil association.

The lacustrine or lake deposits form an upper layer of soils about 5 to 15 feet thick covering the gentle or undulating plain that comprises the project area. These deposits consist of soils ranging from silty clay to clayey and sandy silts with rounded gravel and some silty sand. Underlying the lacustrine deposits are layers of Ashtabula Till which extend to bedrock. This glacial till consists mainly of hard clayey to sandy silts with angular gravel and rock fragments.

Shales of the Chagrin Formation of Devonian Age dominate the bedrock underlying the soil overburden. Outcrops of the bedrock are generally present in the escarpments along stream channels. The Chagrin Formation forms the bedrock in the eastern and western portions of Ashtabula County, extending north beneath Lake Erie and south to the Portage Escarpment. Bedrock beneath the study area generally consists of the shales of this formation with an upper sandstone unit, approximately 3 feet in thickness. The bedrock within the study area is overlain by glacial deposits of Wisconsin Age, and are of particular importance in local groundwater movement. This report emphasizes the hydrogeologic conditions of these glacial deposits.

4.3. Hydrogeologic Characterization and Methods

Union Carbide's facilities are located within the outcrop area of the underlying bedrock, particularly the shales of the Chagrin Formation, including an upper sandstone bed. The outcrop area encompasses the east and west portions of northern Ashtabula County, extending to the north under Lake Erie and south to the Portage Escarpment. Much of the bedrock is covered by overlying soils, but as mentioned previously outcrop exposures can be found along the channel of the Ashtabula River and along the Portage Escarpment.

Water within the bedrock is locally confined by the overlying sediments. As in other locations along the lake, the potentiometric head of bedrock horizons may even be above the ground surface. No wells drilled to bedrock are located within the immediate vicinity. Also, the entire area along the lake is located in what is referred to as a regional groundwater discharge area. This suggests that deeper aquifers will have a dominant upward gradient, discharging into Lake Erie. These facts infer that shallow-contaminated groundwater will tend to migrate laterally down gradient rather than vertically downward.

The fine-grained soils which underlie the U.C.C. disposal site occupy three major layers: 1) the upper 0.5 to 2.0 feet of topsoil is a dark brown to black silty organic clay (OL), 2) the top soil is underlaid by 5 to 15 feet of lacustrine clays, and 3) immediately overlying the bedrock is 20-75 feet of glacial till. The lacustrine clays consist of brown to brown/gray mottled silty clay of low to moderate plasticity. The glacial till consists mainly of gray clayey to sandy silts (ML) with local lenses (1-5 feet) of silty sands (SM) and silty clays (CL, CLCH). At several other locations in northern Ashtabula County, similar sands containing some gravel occur in deposits of up to 10-30 feet thick but of very limited lateral extent.

To evaluate the hydraulic properties of the soils, falling head permeability tests were performed as discussed previously. Six tests were performed in the field in the standpipe piezometers, and seven tests were conducted in the laboratory on undisturbed samples obtained during the drilling operation.

The field permeability test determines mainly the horizontal permeability* (k_h) of the soil while the laboratory test determines mainly the vertical permeability* (k_v). However, the laboratory test can also be used to determine the horizontal permeability by changing the orientation of the sample.

The results of these tests are summarized below:

Field Tests

TB-101 @ 65.5-68.5 ft. in glacial till (CL-ML), $k_h = 4.9 \times 10^{-8}$ cm/sec
TB-102 @ 7-10 ft. in slag fill (SM), $k_h = 4.5 \times 10^{-5}$ cm/sec
TB-103 @ 67-70 ft. in fly ash sludge, $k_h = 2.3 \times 10^{-7}$ cm/sec
TB-104 @ 25.5-28.5 ft. in glacial till (ML) $k_h = 3.1 \times 10^{-5}$ cm/sec
TB-105 @ 10-13 ft. in clay fill (CL), $k_h = 6.8 \times 10^{-6}$ cm/sec
TB-105A @ 18-20 ft. in glacial till (ML), $k_h = 1.2 \times 10^{-5}$ cm/sec

Lab Tests

TB-103 @ 30-32.5 ft. in fly ash sludge, $k_v = 1.0 \times 10^{-5}$ cm/sec
TB-103 @ 69-69.5 ft. in clay fill (CL), $k_v = 2.4 \times 10^{-8}$ cm/sec
TB-104 @ 14.5-15 ft. in clay (CL), $k_v = 1.5 \times 10^{-8}$ cm/sec
TB-105A @ 5-7 ft. in clay fill (CL), $k_v = 4.6 \times 10^{-9}$ cm/sec
TB-105A @ 10-12 ft. in clay (CL), $k_v = 4.1 \times 10^{-8}$ cm/sec
TB-105A @ 15-17 ft. in glacial till (ML), $k_v = 1.6 \times 10^{-5}$ cm/sec
TB-102 @ 10-12 ft. in clay (CL), $k_h = 4.3 \times 10^{-8}$ cm/sec

From these tests, it was determined that the lacustrine clays are relatively impervious with a very low average permeability. These clays would likewise have a low transmissivity.

To aid in the evaluation of the presence of groundwater in the soils, several standpipe piezometers were installed. These monitoring wells verified the presence of groundwater in the glacial till occurring at depths of 7 to 17 feet below the existing ground surface. The groundwater is confined by the overlying lacustrine clays resulting in the pressure head of 6 to 14 feet below the existing ground surface. The piezometer tip in TB-101 also gave an indication of the pressure head of the groundwater that is confined in the underlying shale bedrock. A graphic presentation is shown in Figures 4 and 5.

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* Permeability is the flow rate of water which moves through a 1-square foot cross-sectional area of material under a unit hydraulic gradient.

Recharge to the glacial till occurs mainly as downward infiltration from precipitation, although there is probably some upward leakage of water from the underlying bedrock. The high piezometric level in the till during the dry season indicates that the till as well as much of the overlying lacustrine clays are saturated most of the time. Therefore, much of the potential recharge from precipitation becomes surface runoff.

Of the 38 inches of average yearly precipitation, 20-30 inches return to the atmosphere through evapotranspiration and 5-10 inches run off, leaving only 4-8 inches for infiltration.

Except for isolated occurrences of thick sand deposits, the glacial till is generally a poor source of continuous large water supplies. The head loss in production wells drilled in this area would be considerable. These factors are reflected in the data presented on the Groundwater Resources Map of Ashtabula County prepared by ODNR. In the project site area, well production from the till is usually less than 10 gpm with a few scattered locations approaching 30 gpm.

4.4. Groundwater Quality: Sampling Methods:

As a part of the monitoring program a number of groundwater samples were retrieved and analyzed for contaminants. The samples were retrieved by the two different methods described below:

(1) An ISCO sampler with a tubing pump was used to pump water samples from the monitor well. The 3/8-inch I.D. sample tubing, up to 30 ft. in length was lowered into the well and then four liters of sample was collected (The tubing was purged prior to sample collection). This method drew water samples up to 15 feet below the sampler elevation.

(2) A sampling device constructed from 1-1/2-inch PVC flush joint pipe and a 1-1/2-inch PVC well point was lowered into the well. Once the pipe filled with the sample, a ball check valve retained the sample in the 1-1/2 inch pipe. Then the device was pulled to the surface and the sample was transferred to a collection bottle. The sampler holds

about 450 ml of sample. This method was used for samples which were more than 15 feet below the surface.

The samples collected under this program were analyzed by Union Carbide Corporation and/or Envirolab, Inc., Painesville, Ohio. All samples were analyzed in accordance with "Standard Methods".

4.5. Ground Water Quality: Results

The results of the groundwater study are presented in Tables 4 through 11.

The "Student's T-test" was used to analyze the tabulated results, as recommended in Chapter 4 of EPA manual SW-828 ("Classifying Solid Waste Disposal Facilities-A Guidance Manual", March 1980). The sampling results were compared with the results of Well 104 which was considered to be the upgradient well and therefore Well 104 was considered representative of "normal" groundwater in the area. Although there is a great variation in sampling data, by using this statistical method, only a very few samples were found to be significantly different at the 95% level from (Well 104) the background concentrations.

The analysis of water from Well 101, which is sampling water at the level of Lake Erie, reveal the presence of salt water, which can be expected in view of the known salt deposits under the lake.

The water samples from Well 102 show significantly elevated levels of ammonia and organic nitrogen, which is apparently leaching from the contents of Pond 3 and its berm. This well also shows a significant elevation of pH which correlates with the ammonia concentration. A significant, although lower level of ammonia is also evident in Well 101, at the same location, but in a deeper stratum.

The water samples from Well 103 are indicative of the wastewater sludge deposited in pond 3. The difference in static water elevations shows a significant outward flow gradient from Well 103 to 102. This static water level is also at the same elevation as the water in pond 3A.

The only other significant difference appears in the Well 105 samples for conductivity and Calcium.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Very few baseline data describing the local conditions in the Ashtabula area are available. Engineering-Science has, conducted as careful and thorough an analysis as possible, and reached the following major conclusions concerning the conditions of the Ashtabula Industrial Complex.

1. Leachate from the wastes deposited in Ponds 3 and 3A appears to be migrating through the containment dike into the local groundwater. Apparently ammonia contained in the fly ash is being leached by the highly alkaline lime waste in the fill.

2. This leachate appears to be affecting only the groundwater in the upper stratum and not that in the deeper strata.

3. The leachate will continue to contaminate the underlying groundwater even if all disposal in Ponds 3 and 3A is stopped.

   [The ponds contain sufficient water (22 ft pressure head) to produce leachate long after operations there are shut down. This problem is compounded by the effects of normal precipitation which can contribute at least 8 inches of net head on the Pond 3-3A area (58 acres) per year. This translates to 38.6 acre-ft of water for percolation or leachate at equilibrium. The result is about 12 million gallons of leachate flow per year].

4. The sludges produced by the Metals Division and the Linde Welding Products Division have very different chemical characteristics. The NPDES permits for the two facilities reflect these differences, as should the respective short and long term disposal plans.

5.2. Recommendations

The recommendations which follow are divided into short term (approximately one year) and long term (greater than one year) time spans. The short term recommendations are presented in the following subsection. A more detailed series of long term recommendations and an operation plan is presented in a later subsection.

5.3. Short Term Operations

The Union Carbide Corporation Ashtabula facilities must continue to operate in the short term while "long-term" modifications are made to the waste handling and disposal systems. The short term plan being proposed herein outlines those measures to be taken to improve material handling and the physical appearance of the solid waste and sludge disposal systems. These short-term measures will serve to clean up the solid waste disposal site and to maximize the efficient use of the disposal area.

5.3.1. Housekeeping

The most important modification related to aesthetics to be implemented can be termed "Housekeeping". This term includes those items necessary to bring the site to a minimal standard as explained below:

1) The top of the berm around Pond 3 and Pond 3A must be improved. The first step in this operation is the removal of all the rubbish which has been deposited. This must be done so that a cap can be placed on the berm.

2) The second step will be the grading of the berm to provide roadway and runoff areas.

3) The third step will be the installation of an all-weather road on the berm to provide access to these ponds, as shown in Figure 6.

4) The next step is the sealing of the remainder of the berm and the preparation of temporary fill areas for non-combustible materials (drums, wire, etc).

5.3.2. Combustible Wastes

The Ashtabula Complex currently produces about 3,000 cubic yards of combustible waste per year. Commercial waste haulers in the

Ashtabula area will presently pick up and dispose of this material for about $2.00 per cubic yard or a total cost of $6,000 per year. It is our recommendation that all combustible waste generated at the Ashtabula Complex be handled in this manner. The minimum economic volume for incineration and waste heat recovery is in the range of 20 tons of combustible waste per day or about 7,000 tons per year. (This value corresponds to 80 cubic yards of waste per day or 28,000 cubic yards per year; about ten times the quantities generated at this complex). Capital cost for this size incineration unit is about $600,000.

An on-site landfill for this type of waste would require the full-time attention of at least one employee, in addition to equipment, land and supervision. The cost for an on-site sanitary landfill for combustible materials is therefore estimated to be several times that for off-site disposal. Section 3745-24-09 of the Ohio Administrative Code specifies special requirements for landfills handling combustible wastes which require additional monitoring and operating procedures.

5.3.3. Non-Combustible Wastes

Linde's - recycled

Non-Hazardous: This category includes wire, scrap metal, cleaned drums and other assorted materials. These materials have only a slight possibility of undergoing decomposition while placed in a landfill. The current disposal practice should be modified to incorporate the requirements of a structured landfill operation. This procedure involves planning and clearing an appropriate space for each disposal event, compacting the disposal material, and systematically covering it. + waste lime dust

We recommend that these materials be segregated at the source from the combustible materials for further handling. In the short term, at least, this will necessitate hand picking of combustibles such as waste paper and boxes from the waste bins prior to disposal. These non-combustible materials have some scrap value if they can be separated and it is our recommendation that this be practiced to the extent possible. Those materials which cannot be sold for scrap can be landfilled in Pond 3 by constructing individual cells as shown in Figure 7 approximately 20 ft. x 20 ft. x 10 ft. deep on the inside edge of the haul road. A one-foot thick clay liner should be placed on the inside walls of each cell and then the cell filled and compacted.

Following final compaction, a one-foot thick clay liner should be placed on top. The effective capacity of each cell would be about 3,000 cu. ft. (108 Cu. Yds) and should be sufficient for 1.5 weeks operation.

5.3.4. Carbide Shot

The metal shot generated by the Metals Division is classified as slag. It should be disposed of daily, if at all possible, in order to minimize the amount of gas generated at any time by the reaction of water with the residual carbide. This slag has characteristics which make its disposal appropriate for Pond 3.

5.3.5. Wastewater Sludge

This category contains wastes produced by the manufacturing operations occurring at the Ashtabula site, mostly in the form of wastewater treatment sludges generated by the Linde Division and the Metals Division. These sludges have distinctly different characteristics and we recommended that they be handled and disposed in different areas. On a short-term basis the Metals Division wastes can be handled as is presently the case, i.e., by using Pond 3A as the repository of the mud-cat dredgings. This is a desirable strategy for the long term plan as well.

The materials generated by the Linde Welding Products Treatment Pond should be dewatered to at least 30 percent dry solids and then deposited in a landfill.

5.4. LONG TERM OPERATIONS

The recommendations contained in this section will enable Union Carbide Corporation to dispose of the solid and semi-solid wastes generated at the Ashtabula Complex in an environmentally sound manner for at least 20 years into the future.

5.4.1. Combustible Wastes

These wastes should be segregated from the remainder of the solid waste produced at the Ashtabula Complex and hauled off-site by a private hauler. This is a continuation of the practice recommended in the short-term plan.

5.4.2. Non-Combustible Wastes

In the same manner as described in the short-term plan these wastes should be deposited in prepared cells on top of Pond 3. The wastes should be compacted daily and a clay cover one foot thick should be placed on each cell after filling. These cells should be constructed starting at the northwest corner of Pond 3 in a checkerboard fashion so as to effectively cap and seal the disposal area and direct runoff away from the wastes. Detail cross-sections and layouts are shown on the accompanying plans.

The clay material needed for cover is available directly north of Pond 3 and west of Pond 4. This area can also be used to stockpile additional clay material provided by outside sources.

5.4.3. Wastewater Sludge

The Metals Division Wastewater Sludge will continue to be deposited in Pond 3A. As shown on the detailed plans, it will be necessary to raise the dike around Pond 3A as the level of fill material increases. The ultimate level shown on the plans allows for greater than 20 years of operations at the existing sludge generation rates. A clay cap one foot thick should be placed on the fill area after it reaches the ultimate level.

The Linde Welding Products sludge should be dewatered and then deposited in a clay lined landfill located west of Linde's complex and south of Pond 2. The cells should be constructed using the existing grade as bottom and a dike above grade for the sidewalls. The dewatered sludge should then be deposited inside the dike and a clay cap applied at least once a week.

Since none of this material is being transported from the site it will not presently be necessary to comply with the EPA manifest system regulations currently in effect.

5.4.4. Leachate Control and Monitoring

Leachate is currently being produced by Pond 3 - and 3A is entering the upper groundwater strata. We recommend that a leachate collection system be constructed consisting of a perforated open joint curtain drain and an impervious clay barrier. The leachate collected by this system should be pumped to Pond 4B for treatment in the existing Metals Division Wastewater System prior to discharge to Lake Erie.

A number of additional monitoring wells, as shown on the plans, should be installed for long-term monitoring of the site as required by EPA regulations.

5.4.5. Dust and Runoff Control

The berm and contents of Pond 3 are comprised of fine grain materials which have the potential to create a dust problem under certain weather conditions (i.e. very hot and dry). In order to minimize the generation of dust we recommend that:

1) The roadway areas be constructed of large (#4), crushed limestone with an emulsion surface treatment.

2) The remainder of the berm and final cover area be sown with a grain seed mixture meeting Ohio Department of Transportation (ODOT) specification 659. This practice will provide a cover for the fill area and also serve to moderate the errosive effects of surface water run-off. In addition, sewage sludge if available will be applied to aid fertilization.

5.4.6. Long Term Dike Modifications

Due to the nature of the initial construction of the dikes additional soil borings and water level monitoring data will be collected in the Pond 3A berm area prior to any additional construction to increase capacity in Pond 3A. Additional stability analysis of any modifications will be completed prior to actual construction.

TABLE 1

UNION CARBIDE CORPORATION
ASHTABULA, OHIO

SOLID AND SEMI-SOLID WASTES
Weight Basis

Type of Waste	Metals	Linde Welding	Linde Gas
Combustible, lb/yr	620,500	365,000	550,000
Waste Oil Gal/Yr	20,000		3,600
Non-Combustible Non-Hazardous Vermiculite, Wire, Scrap for Recycling lb/yr	2,200,000	1,375,000	25,000
Wastewater Sludge, lb/yr	56,730,000	1,600,000*	-0-
Metal Shot	1,300,000	—	—

* Defined as hazardous under EPA regulations published 5/19/80

TABLE 2

UNION CARBIDE CORPORATION
ASHTABULA, OHIO

SOLID AND SEMI-SOLID WASTES
Volume Basis

Type of Waste	Metals	Linde Welding	Linde Gas
Combustible (500 lb/C.Y.) yds/yr Std. solid waste	1,240	730	1,092
Waste oil, Gal/yr	20,000	-0-	3,600
Non-Combustible Non-Hazardous (1,000 lb/C.Y.)	2,200	1,375	58(1)
Wastewater Sludge, C.Y./Yr	52,500(2)	2,460(3)*	-0-
Metal Shot C.Y./Yr	283(4)	-0-	-0-

1. 430 lb/Cu.Yd. (Vermiculite) Perry's Chem. Eng. Handbook, 4th Edition, Pg. 7-3.
2. 40 lb/ft^3 = 1,080 lb/C.Y. Dry Solids (Lab Analysis)
3. 30 percent Solids 24 lb/ft^3 = 650 lb/C.Y. Dry Solids (Based on 2 above)
4. 170 lb/ft^3 = 4,590 lb/C.Y. (Perry's Chem. Eng. Handbook), Pg. 3-89.

* Defined as hazardous under EPA regulations published 5/19/80

TABLE 3

SLUDGE COMPOSITION

METALS DIVISION

	Sludge from Carbide Scrubbers including CN	Sludge from Thickener Underflow 20 Furnace (500 gpm) including Phenol
Dry Solids %	12	28
Ignition loss %	17	8
C	14.56	20.17
Fe	3.3	4.30
Si	3.3	4.30
SiO_2	19.49	33.26
SiC	0.41	7.93
Al_2O_3	1.38	1.17
CaO	20.08	1.47
MgO	12.12	2.17
Mn	.58	1.24
Cr	Neg	Trace
SO_3	1.20	3.40
Unaccounted for	6.52	12.53
pH	11+	11+

Source: Union Carbide Analysis: 10-11-78

TABLE 3

LINDE WELDING PRODUCTS DIVISION

METAL CLEANING LINE SLUDGE
(Continued)

Dry Solids %	8.4
Fe % - dry	16
Cu % - dry	0.41
Mn % - dry	1.1
Cl % - dry	0.14
CN mg/Kg - dry	17
Remainder oxides and calcium	

Source: Union Carbide Analysis: Feb 1980

TABLE 4

UNION CARBIDE CORPORATION
ASHTABULA, OHIO

TEST BORINGS

WATER ELEVATION - STATIC

DATE	2/1/80	2/13/80	2/15/80	3/10/80	3/27/80	
TEST HOLE						DRAW-DOWN Ft
101	638.6	638.6	638.5	636.6	636.6	10*
102	639.0	639.5	640.5	639.1	639.0	0
103	662.0	662.0	658.0	662.0	662.0	7
104	639.7	638.8	640.8	639.7	640.7	5*
105	638.6	639.6	639.7	638.6	638.5	6*
105A	—	—	—	639.0	640.0	

* - Limit of Suction Lift or Dry Hole

TABLE 5

UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

GROUNDWATER SAMPLE 101

SAMPLE DATE	2/1/80	2/15/80	3/10/80	3/27/80*	5/8/80
Temp - °C	5	--	--	--	--
pH - S.U.	7.5	7.8	6.9	7.7	--
Cond- mmho/cm	5800	5900	6800	6500	--
Suspended Solids mg/l	--	--	--	--	--
Al - mg/l	1.7	0.75	6.95	2.1	--
As - mg/l	0.01	0.026	< 0.01	0.036	--
Ba - mg/l	0.1	0.6	1.3	0.4	--
Ca - mg/l	31.25	88	177.5	161	--
Cd - mg/l	0.01	AA	AA	AA	--
Cr - mg/l	0.03	0.02	0.06	0.05	--
Cu - mg/l	--	0.03	0.01	0.07	--
Cl - mg/l	1553	2390	2600	2550	--
Fe(TOT) mg/l	2.8	0.7	5.0	1.2	--
Fe^{+2} mg/l	--	--	--	--	--
Mn - mg/l	0.19	0.20	0.22	0.10	--
Na - mg/l	--	1232	375	325	--
Hg - mg/l	<.0002	< .0002	.0002	.0002	--
Se - mg/l	--	0.019	< 0.01	--	--
Pb - mg/l	0.2	0.2	0.1	AA	--
Zn - mg/l	--	--	0.09	0.13	--
SO_4- mg/l	160	78	48	23	--
NH_3-N mg/l	4.8	5.2	4.9	5.1	5.0
NO_3-N mg/l	0.5	0.5	1.0	<0.3	--
KN-N mg/l	1.1	0.91	0.6	0.56	--
CN - mg/l	0.042	AA	AA	AA	--
Phenol - mg/l	0.008	0.028	AA	AA	--
COD - mg/l	105	113	86	113	--
MBAS - mg/l	<0.1	--	--	--	--

* Filtered #40 Whatman

TABLE 6

UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

GROUNDWATER SAMPLE 102

SAMPLE DATE	2/1/80	2/15/80	2/15/80 Filtrate	3/10/80	3/27/80*	5/8/80
Temp - °C	4	--	--	--	--	--
pH - S.U.	10.6	11.2	--	10.9	11.0	--
Cond- mmho/cm	1300	1300	--	1300	1300	--
Suspended Solids mg/l	--	161	--	--	--	--
Al - mg/l	310	18	7.4	82.5	2.85	--
As - mg/l	2.25	0.12	--	0.037	1.58	--
Ba - mg/l	20.5	0.5	0.2	2.38	0.15	--
Ca - mg/l	625	24	19.2	107.5	21	--
Cd - mg/l	0.03	AA	AA	AA	AA	--
Cr - mg/l	0.52	0.045	0.025	0.12	0.05	--
Cu - mg/l	--	0.05	0.02	0.10	0.07	--
Cl - mg/l	30	<10	--	150	160	--
Fe(TOT) mg/l	310	16	4	75	0.4	--
Fe^{+2} mg/l	--	0.32	--	--	0.3	--
Mn - mg/l	23.5	0.36	0.14	1.0	AA	--
Na - mg/l	--	158	64	190	416	--
Hg - mg/l	0.0012	<.0002	--	.0002	.0018	--
Se - mg/l	--	0.012	--	<0.01	--	--
Pb - mg/l	1.2	0.1	AA	0.25	AA	--
Zn - mg/l	--	--	--	0.34	0.04	--
SO_4- mg/l	470	270	--	250	240	--
NH_3-N mg/l	102	110	--	107	100	99
NO_3-N mg/l	3.5	< 0.3	--	0.9	< .3	--
KN-N mg/l	17.9	17	--	17.9	15.8(17.3)	--
CN - mg/l	0.062	AA	--	AA	AA	--
Phenol - mg/l	0.600	0.150	--	AA	0.100	--
COD - mg/l	240	132	--	148	125	--
MBAS - mg/l	<0.1	--	--	--	--	--

* Filtered #40 Whatman

TABLE 7

UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

GROUNDWATER SAMPLE 103

SAMPLE DATE	2/1/80	2/15/80	3/10/80	3/27/80*
Temp - °C	8	--	--	--
pH - S.U.	11.0	11.7	11/7	11.8
Cond- mmho/cm	800	1900	3700	4400
Suspended Solids mg/l	--	155	--	--
Al - mg/l	4.6	4.3	36.7	7.35
As - mg/l	0.022	0.01	0.015	0.17
Ba - mg/l	0.4	0.3	1.05	1.15
Ca - mg/l	111.25	176	538.7	690
Cd - mg/l	0.01	AA	AA	AA
Cr - mg/l	0.03	0.06	0.11	0.05
Cu - mg/l	--	0.02	0.11	0.08
Cl - mg/l	<10	< 10	58	77
Fe(TOT) mg/l	32.5	26.5	137.5	0.7
Fe^{+2} mg/l	--	--	--	--
Mn - mg/l	0.37	0.14	0.11	0.01
Na - mg/l	--	166	63.75	207
Hg - mg/l	< .0002	< .0002	.0013	.0004
Se - mg/l	--	< 0.01	< 0.01	--
Pb - mg/l	0.10	AA	0.10	AA
Zn - mg/l	--	--	0.59	0.10
SO_4^- mg/l	34	40	90	180
NH_3-N mg/l	1.1	4.3	10.6	10.4
NO_3-N mg/l	0.65	0.4	2.2	< 0.3
KN-N mg/l	1.5	3.8	3.5	11.3
CN - mg/l	0.064	AA	AA	AA
Phenol - mg/l	0.073	0.090	0.498	0.110
COD - mg/l	434	760	1156	530
MBAS - mg/l	0.18	--	--	--

* Filtered #40 Whatman

TABLE 8

UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

GROUNDWATER SAMPLE 104

SAMPLE DATE	2/1/80	2/15/80	3/10/80	3/27/80*	5/8/80
Temp - °C	6	--	--	--	--
pH - S.U.	6.8	7.2	7.2	7.5	--
Cond- mmho/cm	1250	1100	1100	1100	--
Suspended Solids mg/l	--	808	--	--	--
Al - mg/l	2.7	61.9	18.48	0.65	--
As - mg/l	0.037	1.08	0.027	1.68	--
Ba - mg/l	0.1	0.4	0.25	0.20	--
Ca - mg/l	47.5	72	135	140	--
Cd - mg/l	0.01	AA	AA	AA	--
Cr - mg/l	0.02	0.135	0.05	0.02	--
Cu - mg/l	--	0.09	0.01	0.06	--
Cl - mg/l	196	155	120	100	--
Fe(TOT) mg/l	3.6	49	16.75	0.6	--
Fe^{+2} mg/l	--	--	--	--	--
Mn - mg/l	0.51	0.89	2.0	0.90	--
Na - mg/l	--	126	156.25	163	--
Hg - mg/l	<.0002	<.0002	<.0002	.0018	--
Se - mg/l	--	0.019	<0.01	--	--
Pb - mg/l	0.10	AA	0.01	AA	--
Zn - mg/l	--	--	0.04	0.04	--
SO_4- mg/l	180	120	140	130	--
NH_3-N mg/l	<0.1	0.14	<0.1	<0.1	0.42
NO_3-N mg/l	0.9	1.6	1.6	0.3	--
KN-N mg/l	1.1	0.14	1.8	1.1	--
CN - mg/l	<.001	AA	AA	AA	--
Phenol - mg/l	0.007	AA	AA	0.215	--
COD - mg/l	190	207	108	70	--
MBAS - mg/l	<0.1	--	--	--	--

* Filtered #40 Whatman

TABLE 9

UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

GROUNDWATER SAMPLE 105

SAMPLE DATE	2/1/80	2/15/80	3/10/80	3/27/80*	4/10/80	5/8/80
Temp - °C	5	--	--	--	--	--
pH - S.U.	6.5	6.8	6.9	6.9	--	--
Cond- mmho/cm	2700	2700	3100	2900	--	--
Suspended Solids mg/l	--	--	--	--	--	--
Al - mg/l	80	2.7	11.3	1.1	--	--
As - mg/l	0.012	0.01	0.013	1.7	--	--
Ba - mg/l	0.7	0.1	2.0	0.35	--	--
Ca - mg/l	281	482	598.7	420	--	--
Cd - mg/l	0.01	AA	AA	AA	--	--
Cr - mg/l	0.12	0.01	0.32	0.06	--	--
Cu - mg/l	--	0.07	0.26	0.12	--	--
Cl - mg/l	84	105	130	140	--	--
Fe(TOT) mg/l	131	2.1	187.5	0.7	--	--
Fe^{+2} mg/l	--	--	--	--	--	--
Mn - mg/l	2.09	1.0	2.0	1.01	--	--
Na - mg/l	--	128	197.5	255	--	--
Hg - mg/l	0.001	<.0002	.0006	0.066	.0002/ .0010	.0008
Se - mg/l	--	<0.01	0.012	--	--	--
Pb - mg/l	0.10	AA	0.05	AA	--	--
Zn - mg/l	--	--	0.63	0.04	--	--
SO_4- mg/l	1100	1360	1700	1730	--	--
NH_3-N mg/l	< 0.1	< 0.1	<0.1	<0.1	--	--
NO_3-N mg/l	0.4	0.3	1.4	0.3	--	--
KN-N mg/l	0.7	0.7	0.7	1.1	--	--
CN - mg/l	0.008	AA	AA	AA	--	--
Phenol - mg/l	0.004	AA	AA	0.230	--	--
COD - mg/l	281	109	54	90	--	--
MBAS - mg/l	0.45	--	--	--	--	--

* Filtered #40 Whatman

TABLE 10

UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

GROUNDWATER SAMPLE 105A

SAMPLE DATE	3/10/80	2/15/80	3/10/80	3/27/80*	4/10/80	5/8/80
Temp - °C			--	--	--	--
pH - S.U.			7.1	7.8	--	--
Cond- mmho/cm			1300	2200	--	--
Suspended Solids mg/l			--	--	--	--
Al - mg/l			11.93	1.15	--	--
As - mg/l			< 0.01	0.24	--	--
Ba - mg/l			0.15	0.30	--	--
Ca - mg/l			201.3	380	--	
Cd - mg/l			AA	AA	--	--
Cr - mg/l			0.05	0.03	--	--
Cu - mg/l			0.02	0.10	--	--
Cl - mg/l			100	140	--	--
Fe(TOT) mg/l			6.25	0.30	--	--
Fe^{+2} mg/l			--	--	--	--
Mn - mg/l	NO SAMPLES	NO SAMPLES	1.63	1.27	--	--
Na - mg/l			125	271	--	--
Hg - mg/l			0.0058	0.066	.0014/ .0010	0.0014
Se - mg/l			< 0.01	--	--	--
Pb - mg/l			0.05	AA	--	--
Zn - mg/l			2.0	5.7	--	--
SO_4- mg/l			410	1180	--	--
NH_3-N mg/l			<0.1	< 0.1	--	--
NO_3-N mg/l			<0.3	< 0.3	--	--
KN-N mg/l			0.7	1.1	--	--
CN - mg/l			AA	AA	--	--
Phenol - mg/l			AA	AA	--	--
COD - mg/l			744	540	--	--
MBAS - mg/l			--	--	--	--

* Filtered #40 Whatman

TABLE 11

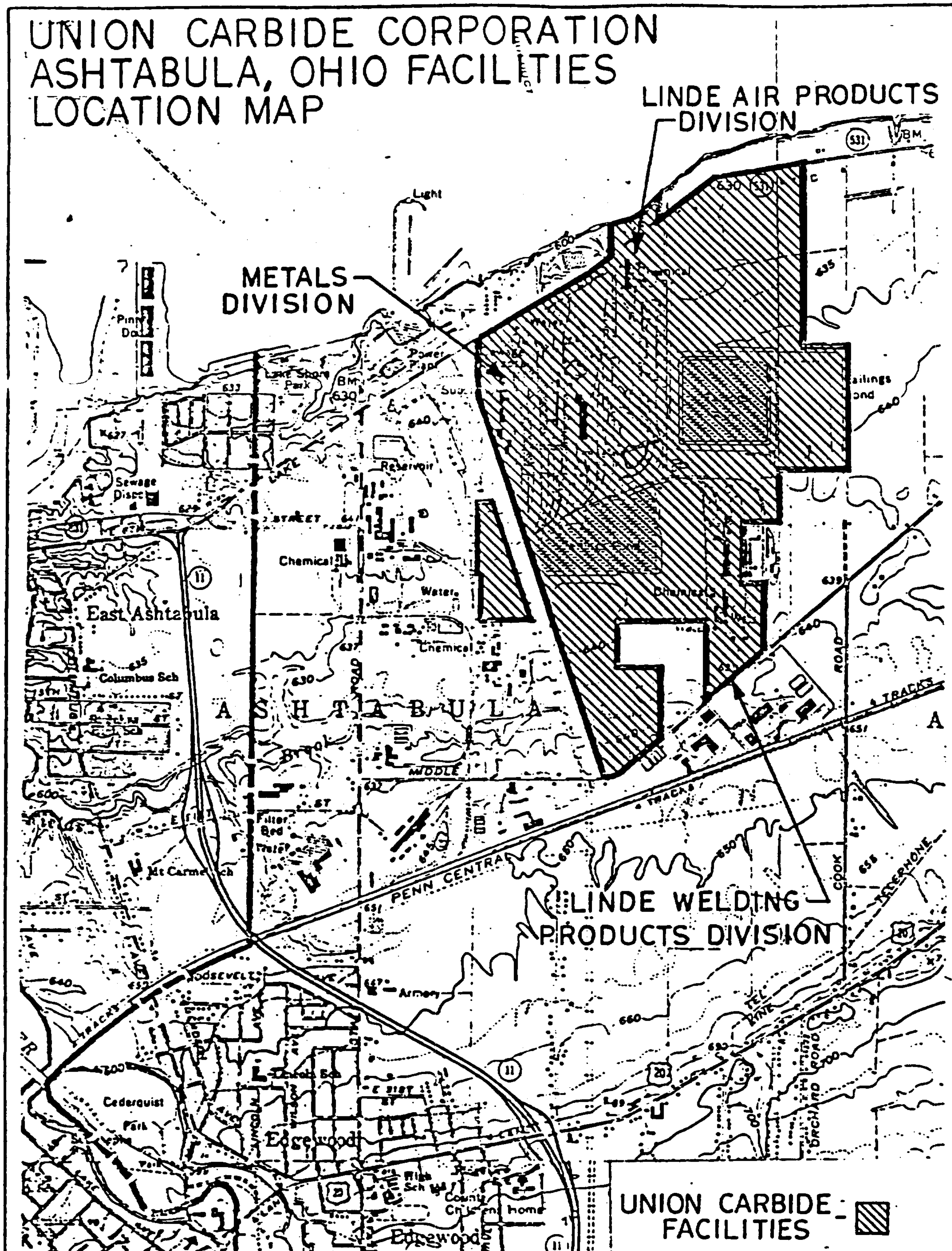
UNION CARBIDE CORPORATION - ASHTABULA, OHIO

GROUNDWATER SAMPLING RESULTS

AVERAGES

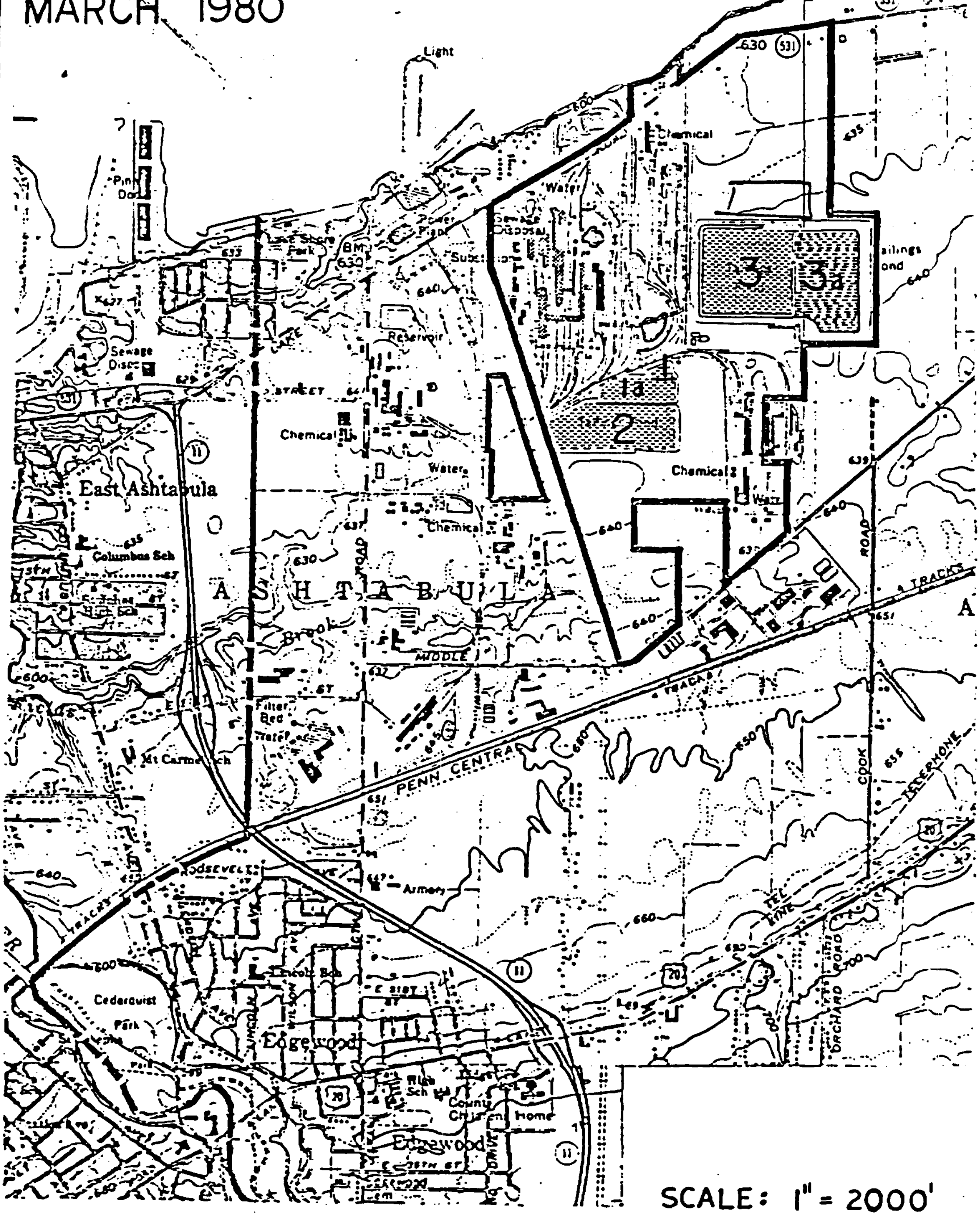
PARAMETER	SAMPLING WELL 104	101	102	103	105	105A	WATER QUALITY STANDARD
Cond-mmho/cm	1137	6250*	1300	2700	2850*	1750	1200
Al-mg/1	20.9	2.88	100	13.2	23.7	6.5	
As-mg/1	0.70	0.021	1.00	0.054	0.43	0.12	0.05
Ba-mg/1	0.25	0.60	5.8	0.72	0.79	0.22	1.0
Ca-mg/1	99	114	193	378	445*	290	
Cd-mg/1	0.0025	0.0025	0.0075	0.0025	0.0025	0.0	0.01
Cr-mg/1	0.056	0.04	0.178	0.0625	0.13	0.04	0.05
Cu-mg/1	0.050	0.036	0.063	0.070	0.150	0.060	1.0
Cl-mg/1	143	2273*	88	39	115	120	250
Fe-mg/1	17.5	2.42	97	49	80	3.3	
Mn-mg/1	1.08	0.178	6.2	0.158	1.52	1.45	0.05
Na-mg/1	148	644	223	146	194	198	
Hg-mg/1	0.0006	0.0002	0.0009	0.0005	0.0098	0.015	0.002
Se-mg/1	0.015	0.015	0.011	0.010	0.011	0.010	0.010
Pb-mg/1	0.050	0.125	0.360	0.050	0.040	0.025	0.05
Zn-mg/1	0.04	0.11	0.19	0.35	0.33	3.85	5.0
SO_4-mg/1	142	77	307	86	1137	795	250
NH_3-N mg/1	0.17	5.0*	103.6*	6.6	0.10	0.10	
NO_3-N mg/1	1.10	0.58	1.25	1.11	0.60	0.30	10.0
KN-N mg/1	1.04	0.64	17.5*	5.0	0.80	0.90	
CN-mg/1	0	0.010	0.005	0.016	0.002	0	

FIGURE 1



ENGINEERING-SCIENCE ES

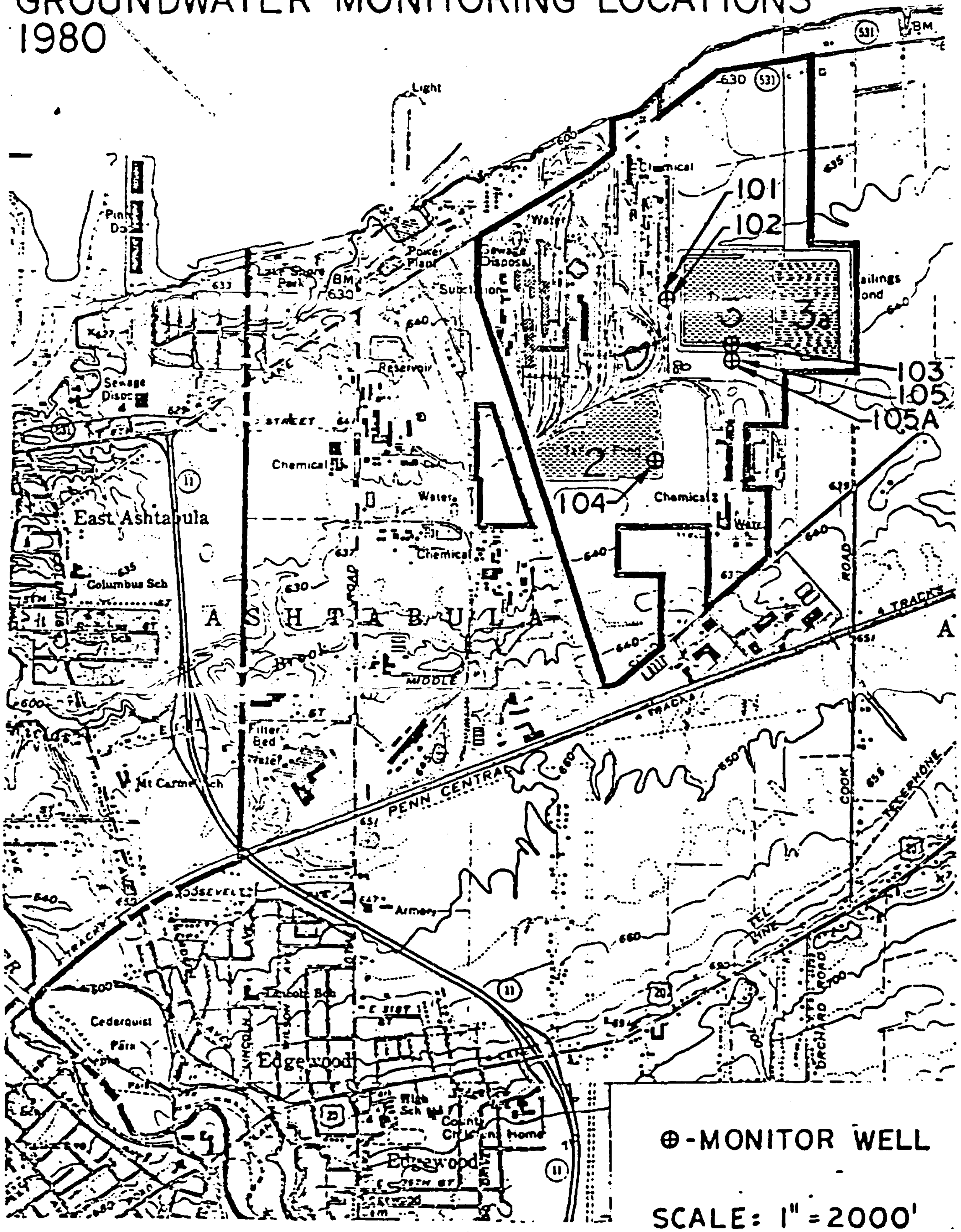
UNION CARBIDE CORPORATION ASHTABULA, OHIO FACILITIES EXISTING SLUDGE PONDS MARCH 1980



SCALE: 1" = 2000'

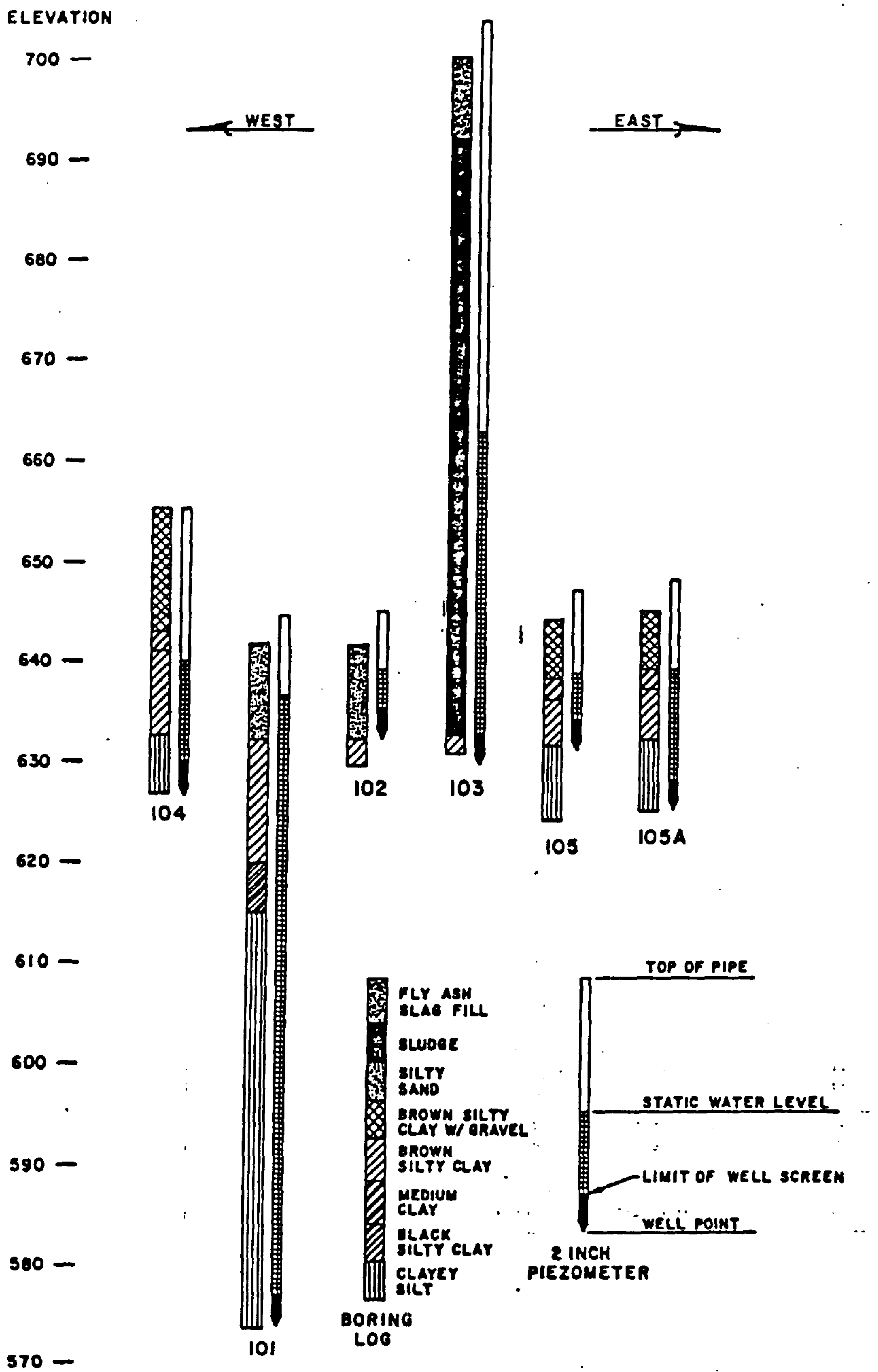
FIGURE 3

UNION CARBIDE CORPORATION ASHTABULA, OHIO GROUNDWATER MONITORING LOCATIONS 1980



ENGINEERING-SCIENCE ES

FIGURE 4

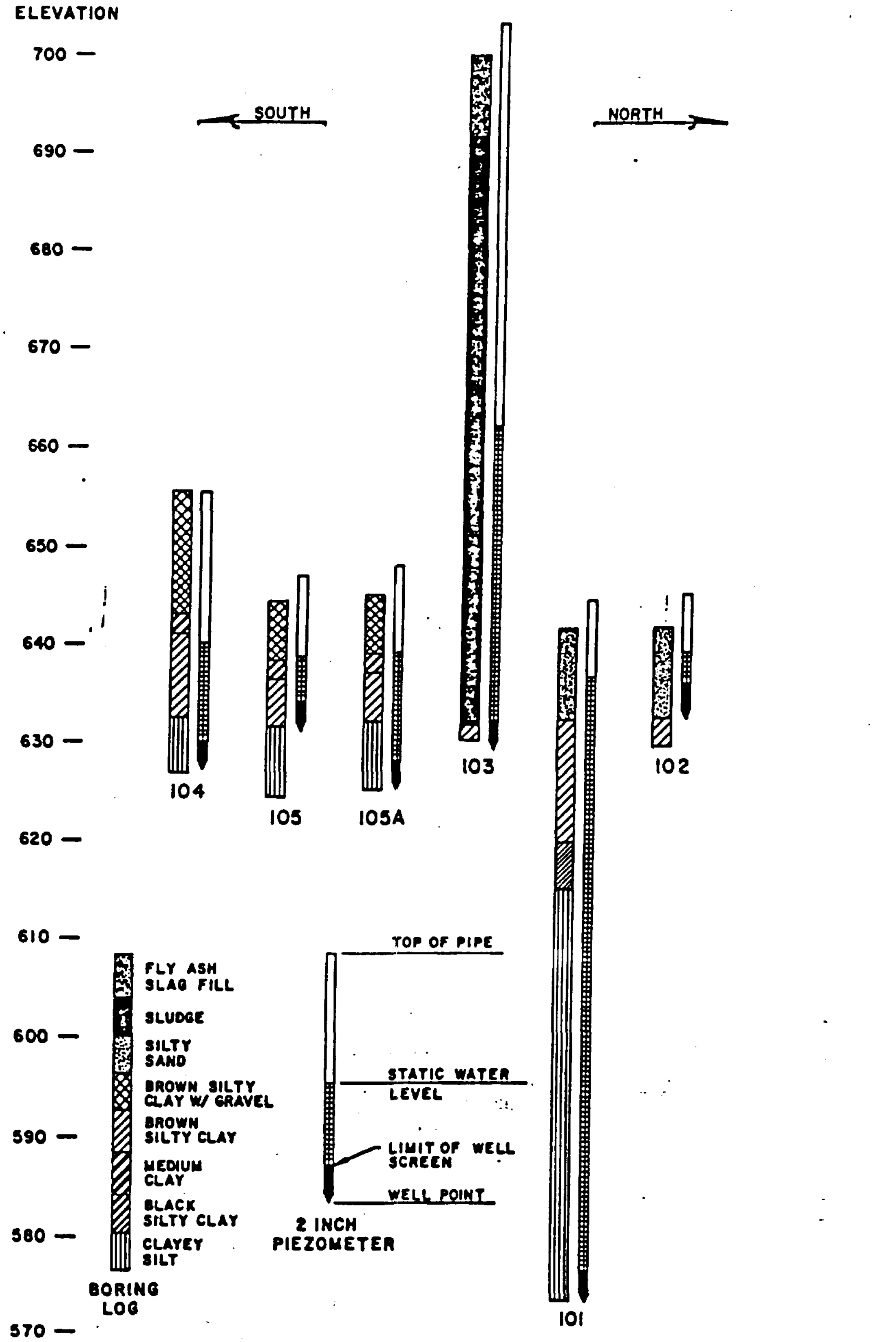


UNION CARBIDE CORPORATION

SOIL BORING RESULTS
CROSS-SECTION WEST TO EAST

ENGINEERING-SCIENCE ES

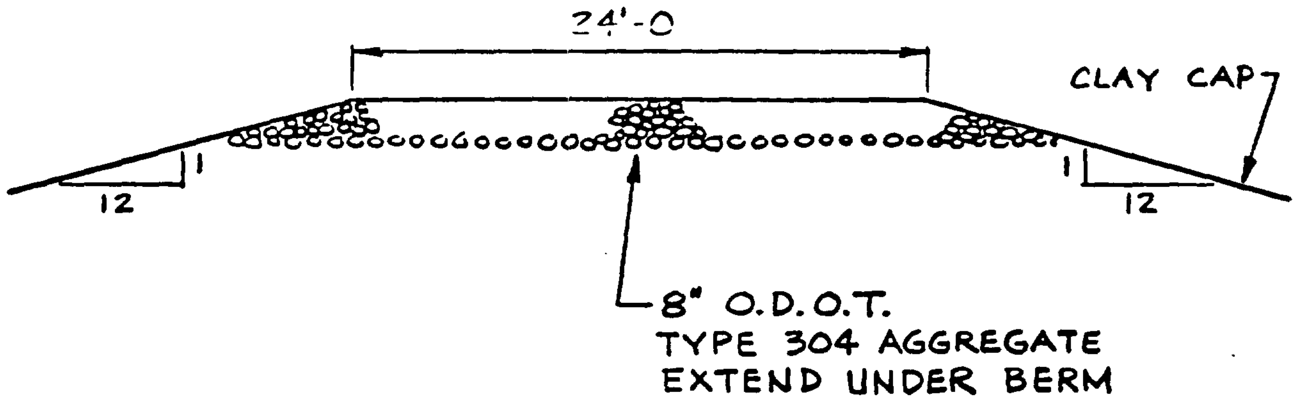
FIGURE 5



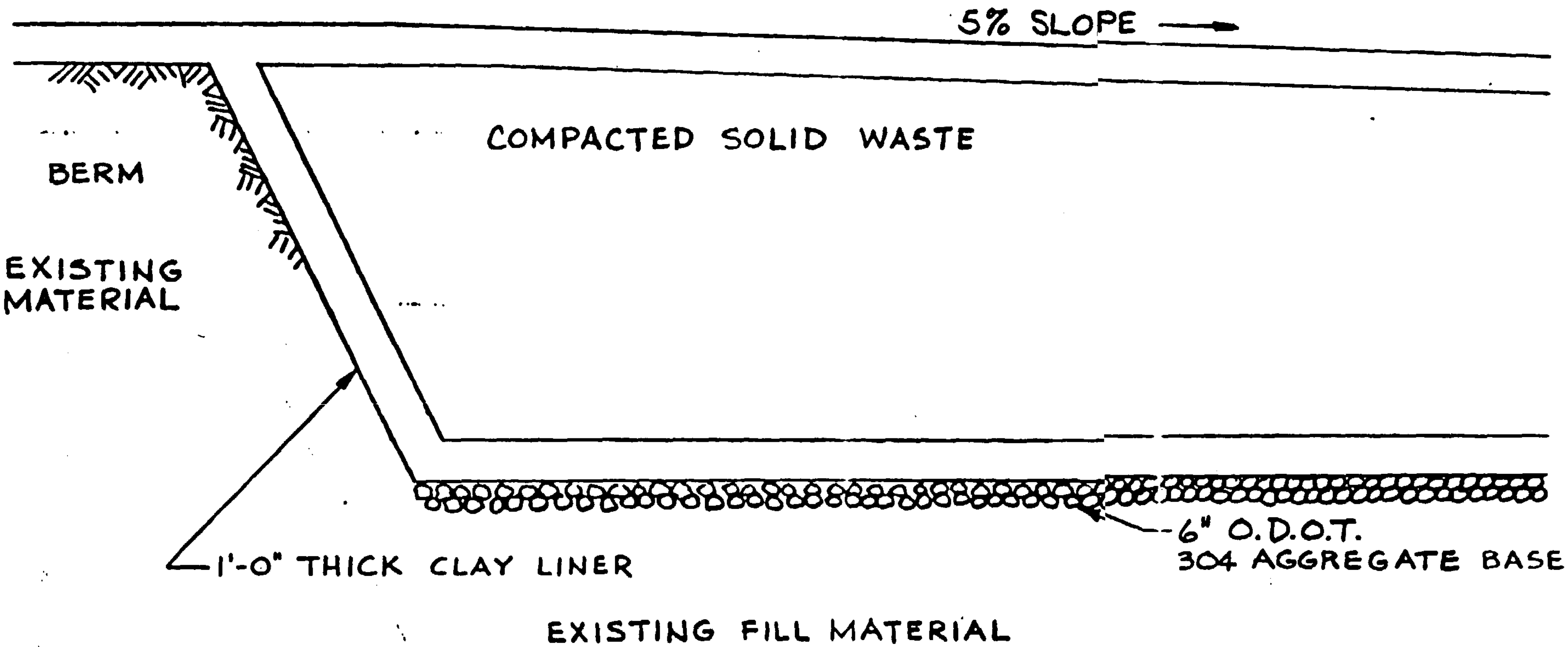
UNION CARBIDE CORPORATION

SOIL BORING RESULTS
CROSS-SECTION SOUTH TO NORTH

ENGINEERING-SCIENCE ES



HAUL ROAD AND BERM
FINAL GRADING SECTION
N.T.S.



SECTION OF LANDFILL CELL

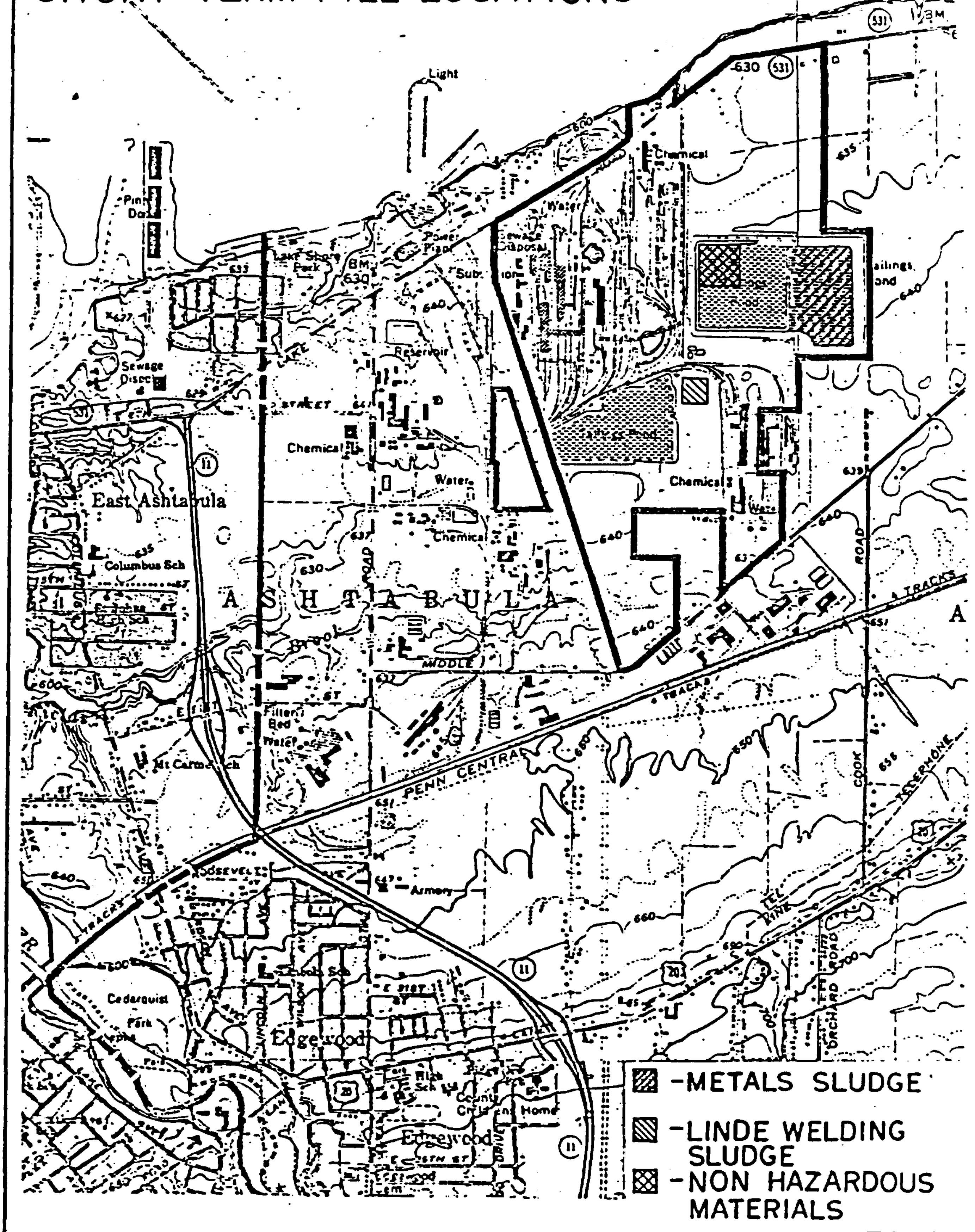
N.T.S.

FIGURE 7

ENGINEERING-SCIENCE ES

FIGURE 6

UNION CARBIDE CORPORATION
ASHTABULA, OHIO
SHORT TERM FILL LOCATIONS



ENGINEERING-SCIENCE ES

BORING LOCATION See Plan

DRILLED BY Tony-Herron Testing

LOGGED BY R. L. Zook REVEIWED R. L. Zook

CASING ID ______ GROUND EL.(MSL) 641.8 DATE START/FINISH 1-13-80 / 1-16-80

CORE SIZE ______ INCLINATION ______ DEPTH to WATER TABLE 7.5 ft DATE 1-15-80

CORE TYPE ______ BEARING ______ TOTAL DEPTH 68.5 ft.

EL. MSL ft	SAMPLE DEPTH ft	SAMPLE TYPE and No.	N or REC	RATE OF ADV. min/ft	WATER CONTENT or RQD %	GRAPHIC	PRESSURE TEST gpm psi	COMPUTED k 10^{-4} cm/sec	STRIKE, DIP	CORE BREAKS	- SOIL AND ROCK DESCRIPTIONS - (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, HARDNESS, COLOR, HARDNESS, etc.)
	42										V. Stiff, Medium Gray, Clayey SILT (ML) w/ some sand pockets, fine-gravel, and clay layers
	44	S-11	7/10/12								
	46										
	48										
	50	S-12	8/12/15								
	52										
	54	S-13	6/10/15								
	56										
	58										
	60	S-14	9/18/22								
	62										
	64	S-15	11/17/26								
	66										
	68										(TILL)
	70										Bottom of Boring 68.5 ft.

LEGEND:
N= STANDARD PENETRATION RESISTANCE, BLOWS/FT
REC=LENGTH RECOVERED/LENGTH CORED, %
RQD=LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
S= SPLIT SPOON SAMPLE U= UNDISTURBED SAMPLES
B= DRILLING BREAK F- FIXED PISTON
W= WEATHERED S- SHELBY TUBE
k= COEFFICIENT OF PERMEABILITY D- DENISON
P- PITCHER
▽= GROUNDWATER O- OSTERBERG

NOTES: Stand pipe piezometer installed at a depth of 68.5 ft. which consist of 2 in. I.D. PVC and 2 in. I.D. x 36 in. long No. 10 slot. PVC well point Stick-up of pipe is 2'9".
24 hr. Piezometric Level @ 5'8"

PAGE 2 OF 2 | LOG OF BORING 101

FORM

BORING LOCATION See Plan — DRILLED BY: Tony-Herron Testing

LOGGED BY R. L. Zook — REVEIWED R. L. Zook

CASING ID ____ GROUND EL.(MSL) 641.6 DATE START/FINISH 1-18-80 / 1-18-80

CORE SIZE ____ INCLINATION Vertical DEPTH to WATER TABLE 4 ft. DATE 1-18-80

CORE TYPE ____ BEARING ____ TOTAL DEPTH 12 ft.

EL. MSL ft	SAMPLE DEPTH ft	SAMPLE TYPE and No.	N or REC	RATE OF ADV min/ft	WATER or RQD CONTENT %	GRAPHIC	PRESSURE TEST gpm psi	COMPUTED k 10^{-4} cm/sec	STRIKE, DIP (F-FOLIATION, J-JOINT, C-CONTACT, B-BEDDING, S-SLICKS)	CORE BREAKS	SOIL AND ROCK DESCRIPTIONS (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, MINERALOGY, COLOR, HARDNESS, etc.)
											Loose to Med. Dense, Black, Silty SAND (SM) w/ lots of slag gravel.
	2										
		S-1	8 / 11 / 9								
	4	S-2	50 / 6"								
	6										
	8										
		S-3	5 / 5 / 5								9.5' (FILL)
	10										Stiff, Brown, Silty CLAY (CL) w/ some fine gravel
		O-4	P								(TILL)
	12										Bottom of Boring @ 12.0 ft
	14										
	16										
	18										

LEGEND:

N= STANDARD PENETRATION RESISTANCE, BLOWS/FT
REC=LENGTH RECOVERED/LENGTH CORED, %
RQD=LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
S= SPLIT SPOON SAMPLE — U= UNDISTURBED SAMPLES
B= DRILLING BREAK — F- FIXED PISTON
WR= WEATHERED — S- SHELBY TUBE
k= COEFFICIENT OF PERMEABILITY — D- DENISON
P- PITCHER
▽= GROUNDWATER — O- OSTERBERG

NOTES:

Stand pipe Piezometer installed at a depth of 9'1". Same type as in TB-101. Stickup is 3'5".

24 hr. Piezometric Level @ 4'6"

PAGE 1 OF 1 — LOG OF BORING 102

FORM

BORING LOCATION See Plan
DRILLED BY: Tony-Herron Testing
LOGGED BY R. L. Zook REVEIWED R.L. Zook
CASING ID ______ GROUND EL.(MSL) 700 DATE START/FINISH 1-21-80 / 1-22-80
CORE SIZE ______ INCLINATION Vertical DEPTH to WATER TABLE ______ DATE ______
CORE TYPE ______ BEARING ______ TOTAL DEPTH 69.5 ft.

EL. MSL ft	SAMPLE DEPTH ft	SAMPLE TYPE and No.	N or REC	RATE OF ADV min/ft	WATER or RQD CONTENT %	GRAPHIC	PRESSURE TEST gpm psi	COMPUTED k 10^{-4} cm/sec	STRIKE,DIP (F-FOLIATION, J-JOINT, C-CONTACT, B-BEDDING, S-SLICKSD)	CORE BREAKS	– SOIL AND ROCK DESCRIPTIONS – (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, MINERALOGY, COLOR, HARDNESS, etc.)
	2										Loose, Gray, Fly Ash/ Slag Fill (Dry)
	4										
	6										
	8										8.0'
	10	S-1	2/1/2								V. Soft, Black, Fly Ash SLUDGE
	12										
	14										
	16										
	18										
	20	S-2	1/1/1								
	22										
	24										
	26										
	28										
	30	U-3									
	32	U-4									
	34										
	36										
	38										

LEGEND:
N= STANDARD PENETRATION RESISTANCE, BLOWS/FT.
REC=LENGTH RECOVERED/LENGTH CORED, %
RQD=LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
S= SPLIT SPOON SAMPLE
B= DRILLING BREAK
W= WEATHERED
k= COEFFICIENT OF PERMEABILITY
GROUNDWATER
U= UNDISTURBED SAMPLES:
F- FIXED PISTON
S- SHELBY TUBE
D- DENISON
P- PITCHER
O- OSTERBERG

NOTES:

PAGE 1 OF 2 LOG OF BORING 103

FORM

BORING LOCATION: See Plan

DRILLED BY: Tony-Herron Testing

LOGGED BY: R. L. Zook   REVIEWED: R. L. Zook

CASING ID: ______   GROUND EL. (MSL): 700   DATE START/FINISH: 1-21-80 / 1-22-80

CORE SIZE: ______   INCLINATION: Vertical   DEPTH to WATER TABLE: ______ DATE: ______

CORE TYPE: ______   BEARING: ______   TOTAL DEPTH: 69.5 ft

EL. MSL ft	SAMPLE DEPTH ft	SAMPLE TYPE and No.	N or REC	RATE OF ADV min/ft	WATER or RQD CONTENT %	GRAPHIC	PRESSURE TEST gpm psi	COMPUTED k 10^{-4} cm/sec	STRIKE, DIP (F-FOLIATION, J-JOINT, C-CONTACT, B-BEDDING, S-SLICKS)	CORE BREAKS	SOIL AND ROCK DESCRIPTIONS (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, MINERALOGY, COLOR, HARDNESS, etc.)
	42										
	44										
	46										
	48										
	50										
	52										
	54										
	56										
	58										
	60										
	62										
	64										
	66										
	68										(FLY ASH SLUDGE)
			P								Med. Stiff, Brown, Silty CLAY (CL)
	70										Bottom of Boring 69.5 ft.

LEGEND:

- N = STANDARD PENETRATION RESISTANCE, BLOWS/FT
- REC = LENGTH RECOVERED/LENGTH CORED, %
- RQD = LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
- S = SPLIT SPOON SAMPLE
- B = DRILLING BREAK
- W = WEATHERED
- k = COEFFICIENT OF PERMEABILITY
- ♀ = GROUNDWATER
- U = UNDISTURBED SAMPLES: F - FIXED PISTON, S - SHELBY TUBE, D - DENISON, P - PITCHER, O - OSTERBERG

NOTES:

Standpipe Piezometer installed at a depth of 70 ft. Stickup is 3.5 ft. 24 hr. Piezometric Level @ 45'7"

BORING LOCATION: See Plan
DRILLED BY: Tony-Herron Testing
LOGGED BY: R. L. Zook REVEIWED: R. L. Zook
CASING ID: ______ GROUND EL. (MSL): 655.7 DATE START/FINISH: 1-18-80 / 1-18-80
CORE SIZE: ______ INCLINATION: Vertical DEPTH to WATER TABLE: ______ DATE: ______
CORE TYPE: ______ BEARING: ______ TOTAL DEPTH: 28.5 ft.

EL. MSL ft	SAMPLE DEPTH ft	SAMPLE TYPE and No.	N or REC	RATE OF ADV min/ft	WATER or RQD CONTENT %	GRAPHIC	PRESSURE TEST GPM PSI	PRESSURE TEST COMPUTED k 10^{-6} cm/sec	STRIKE, DIP (F-FOLIATION, J-JOINT, C-CONTACT, B-BEDDING, S-SLICKENSIDE)	CORE BREAKS	SOIL AND ROCK DESCRIPTIONS (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, MINERALOGY, COLOR, HARDNESS, etc.)
	2										Soft-Stiff, Dk. Brown, Silty, CLAY (CL) w/fine gravel
	4	S-1	2/2/3								
	6										
	8	S-2	2/2/3								
	10	S-3	2/2/4								
	12	S-4	2/3/4								12.5' (FILL)
	14	U-5	P								Soft-Stiff, Black, Silty CLAY (CL) 14.5'
	16										Stiff, Brown and Gray Mottled, Silty CLAY (CL)
	18										
	20	S-6	2/4/7								
	22										
	24										Medium Stiff, Gray, Clayey SILT (ML)
	26										
	28										28.5 ft. (TILL)
	30										Bottom of Boring @ 28.5 ft.
	32										
	34										
	36										
	38										

LEGEND:
N = STANDARD PENETRATION RESISTANCE, BLOWS/FT.
REC = LENGTH RECOVERED/LENGTH CORED, %
RQD = LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
S = SPLIT SPOON SAMPLE U = UNDISTURBED SAMPLES
B = DRILLING BREAK F = FIXED PISTON
WEA = WEATHERED S = SHELBY TUBE
k = COEFFICIENT OF PERMEABILITY D = DENISON
P = PITCHER
▽ = GROUNDWATER O = OSTERBERG

NOTES:
Standpipe Piezometer installed at depth of 28.5 ft. Same type as TB-111. Stickup is 1.0 in.
24 hr. Piezometric Level @ 14'10"

PAGE 1 OF 1 LOG OF BORING 104
FORM

BORING LOCATION: See Plan

DRILLED BY: Tony-Herron Testing

LOGGED BY: R. L. Zook

REVEIWED: R. L. Zook

DATE START/FINISH: 1-21-80 / 1-21-80

DATE

GROUND EL.(MSL): 644.3

DEPTH to WATER TABLE: None @ Drilling

CASING ID:

INCLINATION: Vertical

TOTAL DEPTH: 20- ft

CORE SIZE:

CORE TYPE:

EL. MSL ft	DEPTH ft	SAMPLE TYPE and No.	% REC	RATE OF ADV. min/ft	BEARING WATER or RQD CONTENT %	GRAPHIC	PRESSURE TEST gpm psi	COMPUTED k 10^{-4} cm/sec	STRIKE/DIP (F-FOLIATION, J-JOINT, C-CONTACT, B-BEDDING, S-SLICKS)	CORE BREAKS	SOIL AND ROCK DESCRIPTIONS (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, MINERALOGY, COLOR, HARDNESS, etc.)
											Soft, Dk. Brown, Silty CLAY (CL) w/wood fragments (FILL)
	2										
		S-1	3/3/3								
	4										60' (FILL)
											6.7'
	6	S-2	2/2								Soft, Black, Silty CLAY (OL)
											8.0'
	8										Medium Stiff, Brown, Silty CLAY (CL)
		S-3	3/6/7								
	10										
		S-4	5/6/10								
											13.0'
	12										Medium - V. Stiff, Gray, Clayey SILT (ML) (TILL)
	14	S-5	8/12/14								
	16										
	18										Bottom of Boring 20 ft.
		S-6	12/16/19								

LEGEND:
N= STANDARD PENETRATION RESISTANCE, BLOWS/FT
REC=LENGTH RECOVERED/LENGTH CORED, %
RQD=LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
S= SPLIT SPOON SAMPLE
U= UNDISTURBED SAMPLES:
F- FIXED PISTON
S- SHELBY TUBE
D- DENISON

NOTES: Hole caved, Standpipe piezometer installed at a dept of 13 ft, w/a stickup of 27 in, 24 hr. Piezometric Level @ 6'10"

PAGE 1 OF 1

LOG OF BORING 105

FORM

BORING LOCATION: See Plan
DRILLED BY: Hemel-Herron Testing
LOGGED BY: R. L. Zook
REVIEWED: R. L. Zook

CASING ID: ______
GROUND EL.(MSL): 645.0
DATE START/FINISH: 2-15-80 / 2-15-80

CORE SIZE: ______
INCLINATION: Vertical
DEPTH to WATER TABLE: None @ Drilling
DATE: ______

CORE TYPE: ______
BEARING: ______
TOTAL DEPTH: 20 ft.

EL. MSL ft	SAMPLE DEPTH ft	SAMPLE TYPE and No.	N or REC	RATE OF ADV min/ft	WATER or RQD CONTENT %	GRAPHIC	PRESSURE TEST GPM psi	COMPUTED k 10^{-4} cm/sec	STRIKE, DIP (F-FOLIATION, J-JOINT, C-CONTACT, B-BEDDING, S-SLICKEN.)	CORE BREAKS	SOIL AND ROCK DESCRIPTIONS (WEATHERING, DEFECTS, etc.) (TYPE, TEXTURE, MINERALOGY, COLOR, HARDNESS, etc.)
	0–6.0										Soft, Dk. Brown, Silty CLAY (CL) w/wood fragments (FILL)
	6	U-1	P								6.0'
	6.7–8.0										6.7' Soft, Black, Silty CLAY (CL) 8.0'
	8–13.0	U-2	P								Medium Stiff, Brown, Silty CLAY (CL) w/some gray mottling 13.0'
	13.0–20										Medium - V. Stiff, Gray, Clayey SILT (ML) (TILL)
	16	U-3	P								
	18	U-4	P								Bottom of Boring 20 ft.

LEGEND:
N = STANDARD PENETRATION RESISTANCE, BLOWS/FT
REC = LENGTH RECOVERED/LENGTH CORED, %
RQD = LENGTH OF SOUND CORE 4" AND LONGER/LENGTH CORED, %
S = SPLIT SPOON SAMPLE
U = UNDISTURBED SAMPLES: P- FIXED PISTON, S- SHELBY TUBE, D- DENISON, P- PITCHER, O- OSTERBERG
B = DRILLING BREAK
W = WEATHERED
K = COEFFICIENT OF PERMEABILITY
$\underline{\nabla}$ = GROUNDWATER

NOTES:
Installed 23 ft. of Piezometer w/tip at 20 ft. depth and with 3.0 ft stickup.

PAGE 1 OF 1 | LOG OF BORING 105A

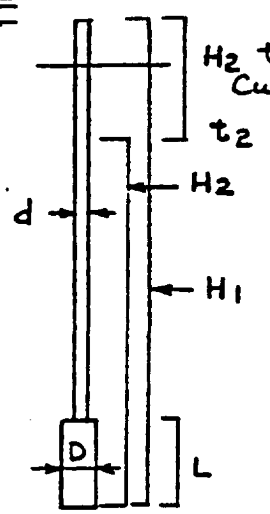
FORM

FALLING HEAD

FIELD PERMEABILITY TESTS

UNION CARBIDE

TB-101



$$K_h = \frac{d^2 \ln\left[\frac{ML}{D} + \sqrt{1 + \left(\frac{ML}{D}\right)^2}\right]}{8L\,(t_2 - t_1)} \ln \frac{H_1}{H_2}$$

$L = 3.0' = 91.44$ cm
$d = 2.0'' = 5.08$ cm
$D = 7.0'' = 17.78$ cm
$M = 2.5$
$H_1 = 816'' = 2072.64$ cm
$H_2 = 813.5'' = 2066.25$ in.
$t_1 = 0$ sec.
$t_2 = 7200$ sec
$H_c = 68.5'$

$$K_h = \frac{(5.08)^2 \ \ln\left[\frac{(2.5)(91.44)}{17.78} + \sqrt{1 + \left(\frac{(2.5)(91.44)}{17.78}\right)^2}\right]}{8.91.44\ (7200-0)} \ln\left(\frac{2072.64}{2066.25}\right)$$

$$= \frac{(25.8064)\ \ln\left[(12.857M3) + \sqrt{1 + (165.30612)}\right]}{5266944} \ln\left(\frac{2072.64}{2066.25}\right)$$

$$= \frac{(25.8064)\ (3.2485556)}{5266944} \ln\left(\frac{2072.64}{2066.25}\right)$$

$$= 4.9096 \times 10^{-8} \text{ cm/sec/ft}^2$$

TB-102

L = 91.44 cm H_1 = 96.75 in = 245.745 in

d = 5.08 cm H_2 = 94.50 in = 240.03 cm

D = 17.78 cm t_1 = 0

m = 2.5 t_2 = 60 sec.

$$K_h = \frac{(5008)^2 \ \ln \left[\frac{(2.5(91.44)}{1778} + \sqrt{1 + \frac{2.5)(91.44)}{17.78}^2}\right]}{8.(91.44)\ (60-0)} \ln\left(\frac{245.745}{240.03}\right)$$

$$= \frac{(25.8064)(3,2485556)}{43891.2} \quad \ln\left(\frac{245.745}{240.03}\right)$$

$$= (0.00191) \quad \ln\left(\frac{245.745}{240.03}\right)$$

$$= 0.0000449 \text{ cm/sec. or } \underline{4.49 \times 10^{-5} \text{ cm/sec./ft}^2}$$

TB-103

L = 91.44 cm H_1 = 829.5 in = 2106.93 cm

d = 5.08 in H_2 = 829.0 in = 2105.66 cm

D = 17.78 in t_1 = 0

m = 2.5 t_2 = 300 sec

$$K_h = \frac{(25.8064)\ (3.2485556)}{8.(91.44)(300-0)} \ln\left(\frac{2106.93}{2105.66}\right)$$

$$= \frac{83.833525}{219456} \ \ln\left(\frac{2106.93}{2105.66}\right)$$

$$= (0.000382) \ \ln\left(\frac{2106.93}{2105.66}\right)$$

$$= 0.0000002 \quad \text{or} \quad \underline{2.30 \times 10^{-7} \text{ cm/sec./ft}}^{2}$$

TB-104

$L = 91.44$ cm	$H_1 = 314$ in. $= 797.56$ cm
$d = 5.08$ cm	$H_2 = 3.09$ in. $= 894/97$ cm
$D = 17.78$ cm	$t_1 = 0$
$m = 2.5$	$t_2 = 60$ sec.

$$K_h = \frac{(83.833525)}{43891.2} \ln \left(\frac{797.56}{784.86}\right)$$

$$= (0.00191) \ln \left(\frac{797.56}{784.86}\right)$$

$$= 0.0000307 \text{ or } \underline{3.07 \times 10^{-5} \text{ cm/sec/ft}^2}$$

TB-105

$L = 91.44$ cm	$H_1 = 114$ in $= 288.56$ cm
$d = 5.08$ cm	$H_2 = 112$ in $= 284.48$ cm
$D = 17.78$ cm	$t_1 = 0$
$m = 2.5$	$t_2 = 300$ sec

$$K_h = \frac{(83833525)}{219456} \ln \frac{289.56}{284.48}$$

$$= (0.000382) \text{ lin } \frac{289.56}{284.48}$$

$$= 0.00000068 \text{ or } \underline{6.8 \times 10^{-6} \text{ cm/in/ft}^2}$$

This permeability partially reflects the properties of the material saved in the hole.

TB-105A

$L = 91.44$ cm $\quad H_1 = 701.04$ cm

$d = 5.08$ cm $\quad H_2 = 677.45$ cm

$D = 17.78$ cm $\quad t_1 = 0$

$m = 2.5$ $\quad t_2 = 300$ sec

$$K_h = \frac{(83.833525)}{219456} \ln\left(\frac{701.04}{679.45}\right)$$

$$= (0.000382) \ln\left(\frac{701.04}{679.45}\right)$$

$$= 0.0000119 \text{ cm/sec. or } \underline{1.19 \times 10^{-5} \text{ cm/sec/ft}^2}$$

REPORT OF MONITORING OF WELL INSTALLATIONS

AT

THE UNION CARBIDE CORPORATION

ASHTABULA, OHIO

F O R

ENGINEERING-SCIENCE, LTD.

HCI Project No. M-9034.14

Report Submittal Date: February 29, 1980

HERRON CONSULTANTS, INC.

ENGINEERING • TESTING • INSPECTION

HERRON CONSULTANTS, INC.
ENGINEERING • TESTING • INSPECTION
5405 SCHAAF ROAD CLEVELAND, OHIO 44131

February 29, 1980

Engineering-Science, Ltd.
19101 Villaview Road
Suite 301
Cleveland, OH 44119

Attention Mr. Jerry Jacobs

SUBJECT: REPORT OF MONITORING OF WELL INSTALLATIONS
THE UNION CARBIDE CORPORATION
ASHTABULA, OHIO

HCI Project No. M-9034.14

As requested by Mr. Jerry Jacobs of Engineering-Science, Ltd., we visited the subject project site and drilled a series of five (5) test holes and installed well point piezometers in each. The drilling operation and well installation was performed under the direction and supervision of Mr. Robert Zook, also of Engineering-Science, Ltd.

At the completion of the field operations, samples were returned to HCI labs for testing as selected by Mr. Zook. Tests requested by Mr. Zook consisted of Atterberg Limits, sieve and hydrometer analysis, specific gravity, permeability, visual classification of Shelby tube samples, and unit weight and moisture contents.

The results of the requested testing and lobs of the test borings, including all pertinent data obtained, are tabulated in the Appendix of this report.

We would like to thank you for giving us the opportunity to work with you on this project and look forward to working with you again in the future.

Should you have any questions relative to this or any other project, please feel free to contact us.

HERRON CONSULTANTS, INC.

Jack Lader

J.J. Lader, Manager
Drilling Department

Leroy J. Mazer/jj

Leroy J. Mazer, C.E.T.
Assistant Manager

/j.

Original and 2cc: Mr. Jerry Jacobs
Engineering-Science, Ltd.

APPENDIX

LABORATORY TEST DATA SUMMARY

TEST BORING LOGS

ATTERBERG LIMITS, SPECIFIC GRAVITY AND USCS SYMBOLS

Sample Identification:	B-101 at 2.5 - 3.5'	B-101 at 18.5 - 20.0'	B-101 at 33.5 - 35.0'	B-101 at 53.5 - 55.0'
Liquid Limit:	--	27	18	25
Plastic Limit:	--	18	18	18
Plasticity Index:	NP	9	0	7
Specific Gravity:	2.67	2.72	2.74	2.74
USCS Symbols:	SM	CL	ML	ML-CL

ATTERBERG LIMITS, SPECIFIC GRAVITY AND USCS SYMBOLS - Cont'd.

Sample Identification:	B-101 at 63.5 - 65.0'	B-102 at 10.0 - 12.0'	B-103 at 30.5 - 32.5'	B-104 at 18.5 - 20.0'
Liquid Limit:	24	33	--	28
Plastic Limit:	17	18	--	20
Plasticity Index:	7	15	--	8
Specific Gravity:	2.67	2.73	1.88	2.69
USCS Symbols:	ML-CL	CL	--	CL

ATTERBERG LIMITS, SPECIFIC GRAVITY AND USCS SYMBOLS - Cont'd.

Sample Identification:	B-105 at 10.5 - 12.0'	B-105 at 18.5 - 20.0'	B-105A at 6.5'
Liquid Limit:	29	--	33
Plastic Limit:	20	--	25
Plasticity Index:	9	NP	8
Specific Gravity:	2.70	2.72	2.64
USCS Symbols:	CL	ML	OL

* * * * * * * * * * * *

PARTICLE-SIZE ANALYSIS

Test Hole No.:	B-101	B-101	B-101
Sample Depth (Ft.):	2.5 - 3.5	18.5 - 20.0	33.5 - 35.0
Per Cent Finer Than:			
U.S. No. 4 sieve	82.3	96.2	100
U.S. No. 10 sieve	69.6	92.4	98.7
U.S. No. 40 sieve	46.0	88.3	96.7
U.S. No. 100 sieve	33.7	85.1	95.2
U.S. No. 200 sieve	23.9	81.6	91.4
0.036 mm	13.9	----	----
0.032 mm	----	----	----
0.031 mm	----	----	60.0
0.030 mm	----	----	----
0.029 mm	----	73.2	----
0.028 mm	----	----	----
0.023 mm	8.4	----	----
0.020 mm	----	----	46.4
0.019 mm	----	64.0	----
0.018 mm	----	----	----
0.014 mm	5.6	----	----
0.012 mm	----	51.2	32.9
0.011 mm	----	----	----
0.010 mm	4.9	----	25.1
0.009 mm	----	----	----
0.008 mm	----	43.9	----
0.007 mm	4.2	----	----
0.006 mm	----	38.4	23.2
0.003 mm	1.4	25.6	15.5
0.001 mm	1.4	16.5	11.6

PARTICLE-SIZE ANALYSIS - Cont'd.

Test Hole No.:	B-101	B-101	B-102
Sample Depth (Ft.):	53.5 - 55.0	63.5 - 65.0	10.0 - 12.0
Per Cent Finer Than:			
U.S. No. 4 sieve	98.1	93.8	99.6
U.S. No. 10 sieve	93.4	87.4	98.1
U.S. No. 40 sieve	86.6	80.3	96.0
U.S. No. 100 sieve	81.7	75.2	92.1
U.S. No. 200 sieve	78.0	71.3	87.9
0.036 mm	----	----	----
0.032 mm	----	----	----
0.031 mm	----	----	----
0.030 mm	----	64.7	----
0.029 mm	71.4	----	----
0.028 mm	----	----	79.3
0.023 mm	----	----	----
0.020 mm	----	57.7	----
0.019 mm	64.1	----	----
0.018 mm	----	----	71.6
0.014 mm	----	----	----
0.012 mm	51.3	45.4	----
0.011 mm	----	----	60.0
0.010 mm	----	----	----
0.009 mm	----	42.0	----
0.008 mm	42.1	----	50.3
0.007 mm	----	----	----
0.006 mm	34.8	33.2	42.6
0.003 mm	23.8	21.0	32.9
0.001 mm	16.5	15.7	23.2

PARTICLE-SIZE ANALYSIS - Cont'd.

Test Hole No.:	B-104	B-105	B-105
Sample Depth (Ft.):	18.5 - 20.0	10.5 - 12.0	18.5 - 20.0
Per Cent Finer Than:			
U.S. No. 4 sieve	100	99.1	100
U.S. No. 10 sieve	98.7	97.4	99.7
U.S. No. 40 sieve	96.4	94.5	99.1
U.S. No. 100 sieve	93.3	92.0	98.6
U.S. No. 200 sieve	85.6	89.7	98.2
0.036 mm	----	----	----
0.032 mm	----	----	----
0.031 mm	----	----	----
0.030 mm	----	----	----
0.029 mm	74.3	79.1	----
0.028 mm	----	----	82.9
0.023 mm	----	----	----
0.020 mm	----	----	61.2
0.019 mm	62.5	65.6	----
0.018 mm	----	----	----
0.014 mm	----	----	----
0.012 mm	48.9	52.1	35.5
0.011 mm	----	----	----
0.010 mm	----	----	----
0.009 mm	41.0	----	23.7
0.008 mm	----	44.4	----
0.007 mm	----	----	17.8
0.006 mm	33.2	34.7	----
0.003 mm	23.5	25.1	11.8
0.001 mm	17.6	17.4	7.9

PARTICLE-SIZE ANALYSIS - Cont'd.

Test Hole No.:	B-105A	B-105A
Sample Depth (Ft.):	6.5	16.5
Per Cent Finer Than:		
U.S. No. 4 sieve	99.3	99.9
U.S. No. 10 sieve	97.7	99.7
U.S. No. 40 sieve	94.5	99.5
U.S. No. 100 sieve	87.4	99.0
U.S. No. 200 sieve	75.1	98.7
0.036 mm	----	----
0.032 mm	58.6	----
0.031 mm	----	----
0.030 mm	----	----
0.029 mm	----	80.0
0.028 mm	----	----
0.023 mm	----	----
0.020 mm	50.8	58.0
0.019 mm	----	----
0.018 mm	----	----
0.014 mm	----	----
0.012 mm	37.1	34.0
0.011 mm	----	----
0.010 mm	----	----
0.009 mm	31.3	22.0
0.008 mm	----	----
0.007 mm	----	16.0
0.006 mm	25.4	----
0.003 mm	17.6	10.0
0.001 mm	11.7	4.0

* * * * * * * * *

PERMEABILITY TEST RESULTS

Sample Identification:	B-102 at 11.5'	B-103 at 32.0'	B-103 at 69.0'
Permeability, cm/sec.:	4.3×10^{-8}	1.0×10^{-5}	2.4×10^{-8}
Apparatus Utilized for Permeability:	Consolidometer at 2 TSF (Horizontal)	ST-3 Shelby Tube at 8.4 PSI Falling Head	Consolidometer at 4 TSF

Sample Identification:	B-104 at 14.5'	B-105A at 6.5'	B-105A at 11.0'
Permeability, cm/sec.:	1.48×10^{-8}	4.65×10^{-9}	4.08×10^{-8}
Apparatus Utilized for Permeability:	Consolidometer at 2 TSF	Consolidometer at 1/2 TSF	Consolidometer at 2 TSF

Sample Identification:	B-105A at 16.5'
Permeability, cm/sec.:	1.56×10^{-5}
Apparatus Utilized for Permeability:	Permeameter Cylinder at 2 PSI Falling Head

* * * * * * * * * * * *

UNIT WEIGHT AND MOISTURE CONTENT

Sample Identification:	B-102 at 11.5'	B-103 at 32.0'	B-103 at 69.0'
Wet Density, Lbs./Cu.Ft.:	134.7	81.6	140.1
Wet Density, Lbs./Cu.Ft.:	115.0	39.9	121.8
Per Cent Moisture:	17.1	104.7	15.0

Sample Identification:	B-104 at 14.5'	B-105A at 6.0'	B-105A at 11.0'
Wet Density, Lbs./Cu.Ft.:	132.6	120.2	132.5
Dry Density, Lbs./Cu.Ft.:	112.0	92.4	111.2
Per Cent Moisture:	18.4	30.1	19.2

Sample Identification:	B-105A at 16.5'
Wet Density, Lbs./Cu.Ft.:	133.1
Dry Density, Lbs./Cu.Ft.:	112.4
Per Cent Moisture:	18.4

* * * * * * * * * * * * *

LOG OF SHELBY TUBE SAMPLES

Test Hole	Material Classification
B-102 at 10.0'-12.0'	Brown and Gray Mottled Silty Clay. Trace Sand and Fine Root Fibers. Moisture tends to decrease with depth. Silty Zone at lower depth.
B-103 at 30.5'-32.5'	Dark Gray with Mottling of Light Gray, Chemical Waste. Saturated. Amonia Odor noted.
B-103 at 68.0'-68.7'	Black and Light Gray Chemical Waste. Moist.
B-103 at 68.7'-69.0'	Brown Silty Clay. Trace Sand and Root Fibers. Moist.
B-103 at 69.0'-69.5'	Brown and Gray Silty Clay to Gray Silty Clay with Oxidation-Stained Zones. Some Sand. Trace Gravel. Some Wood noted. Moist.
B-104 at 13.0'-14.5'	Brownish-Gray Silty Clay. Earthy Organic Odor noted. Thin layer of Partially-Decomposed Vegetation noted.
B-104 at 14.5'-15.0'	Brown and Gray Mottled Silty Clay. Moist.
B-105A at 5.0'-7.0'	Dark Brown Silty Clay, Organic. Some Vegetation noted. Moist.
B-105A at 10.0'-10.3'	Dark Brown Silty Clay, Organic. Moist.
B-105A at 10.3'-10.8'	Brown with Trace of Gray Silty Clay. Trace Sand. Moist.
B-105Aat 10.8'-12.0'	Brown with Some Gray Mottling Silt-Clay. Trace Sand. Crystals noted in formation. Oxidation-Stained. Moist.
B-105A at 15.0'-17.0'	Gray Silt with Some Clay. Moist.
B-105A at 20.0'-22.0'	Gray Silt with Some Clay. Moist.

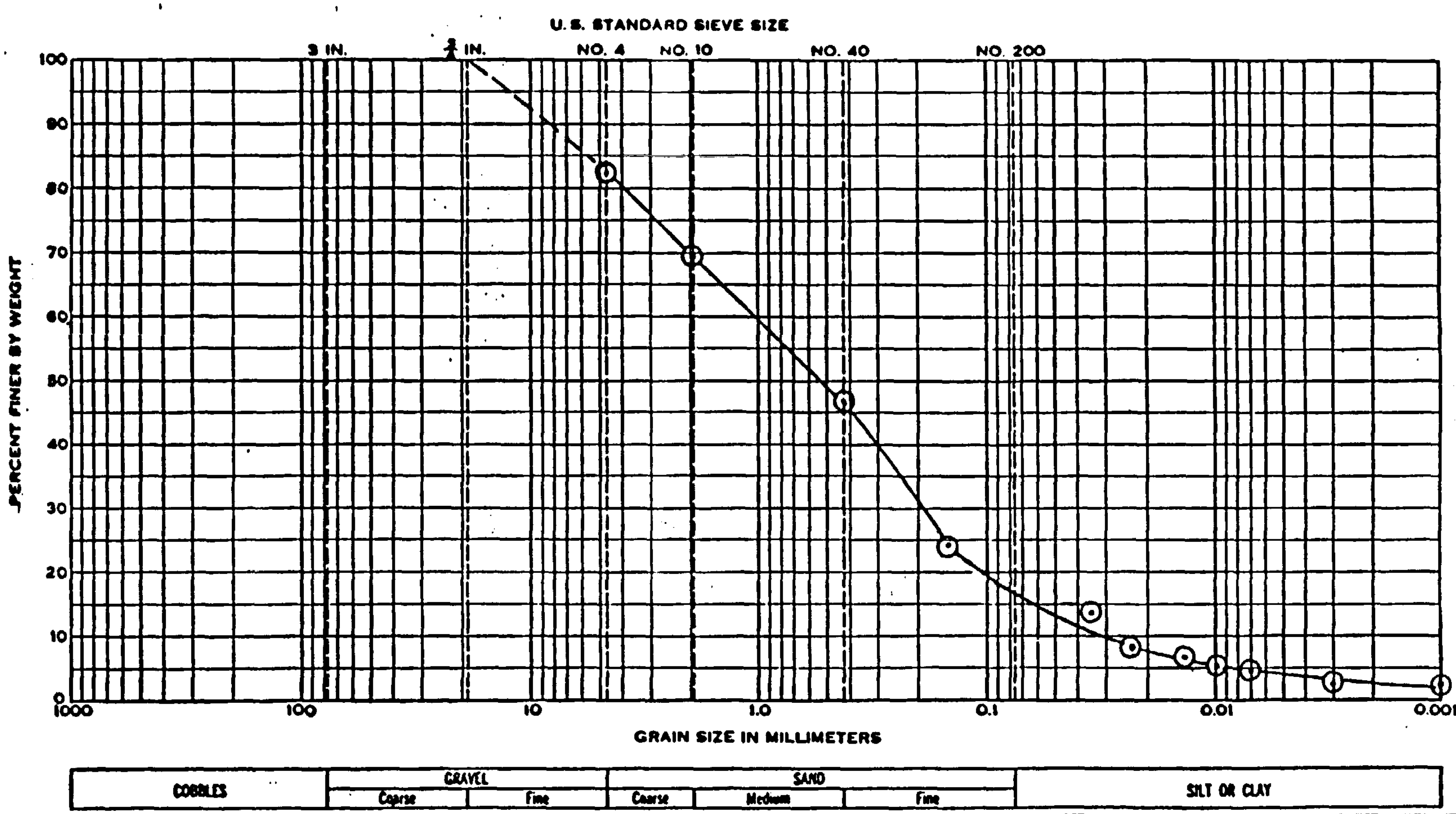
* * * * * * * * * * * *

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
1	2.5'-	(SM)	17.3				Non-Plastic
	3.5'						

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

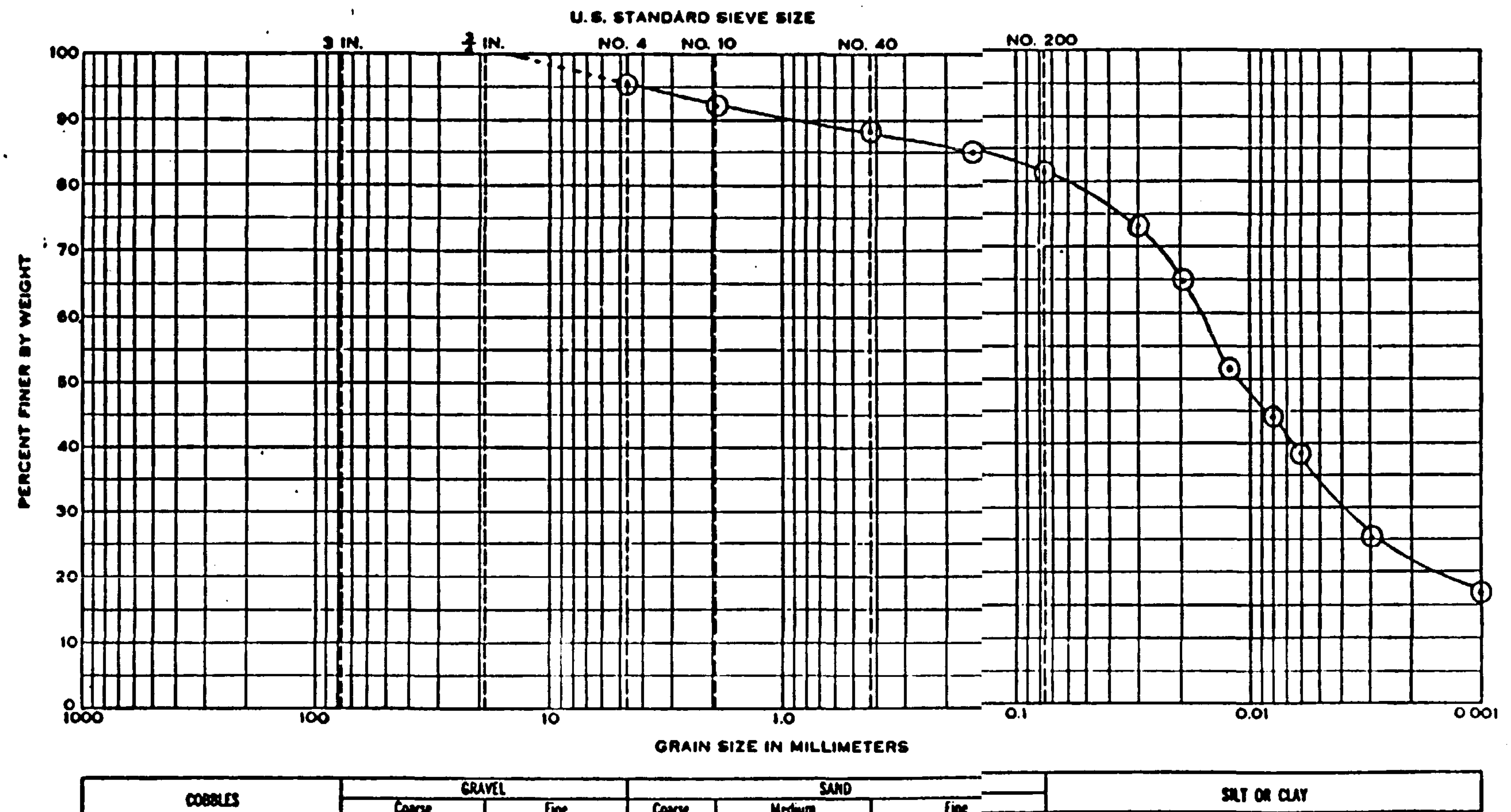
Test Hole: B-101

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI
6	18.5'- 20.0'	(CL)	15.9	26	18	8

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

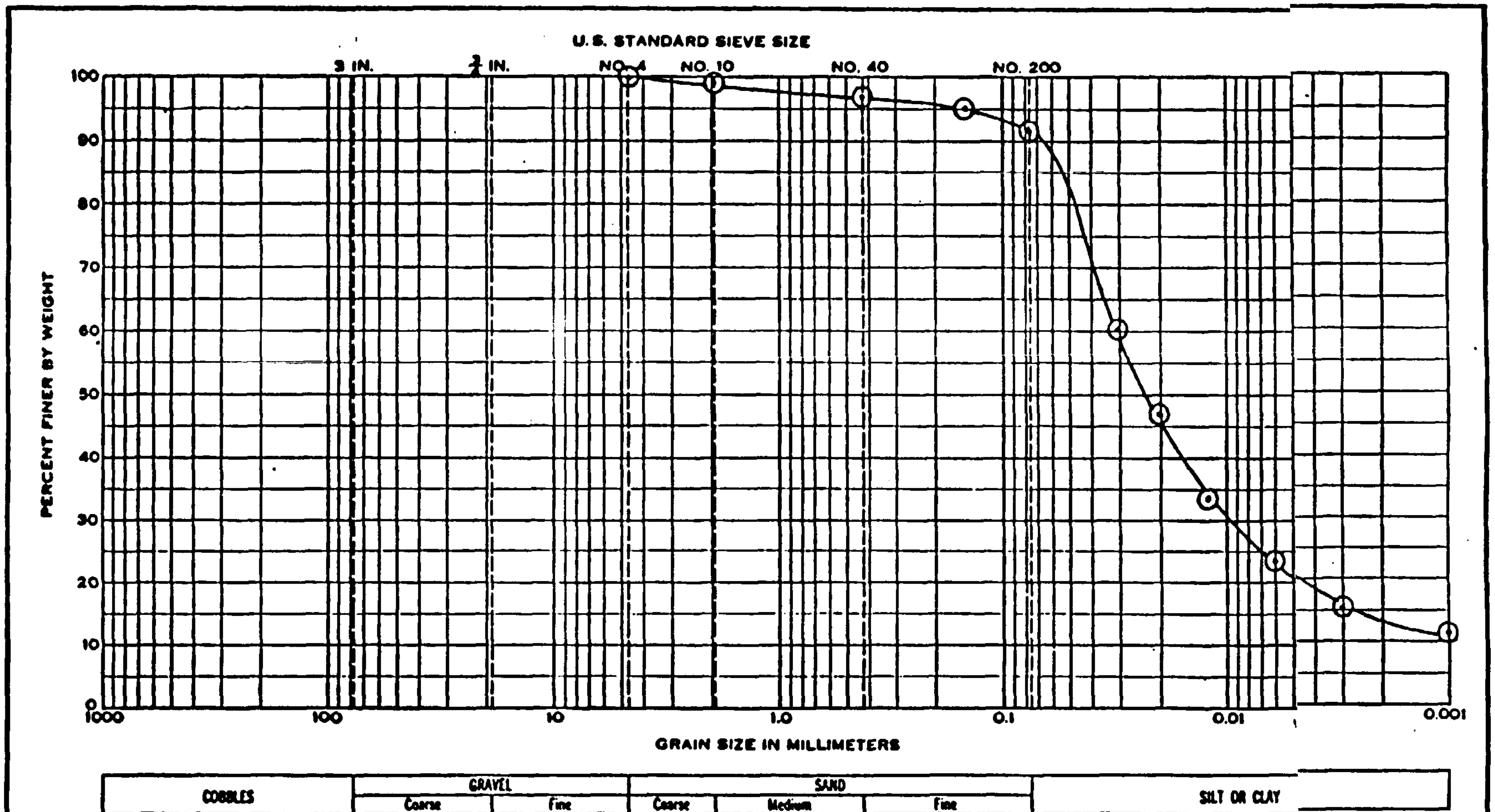
Test Hole: B-101

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
7	33.5'- 35.0'	(ML)	16.2	18	18	0	

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

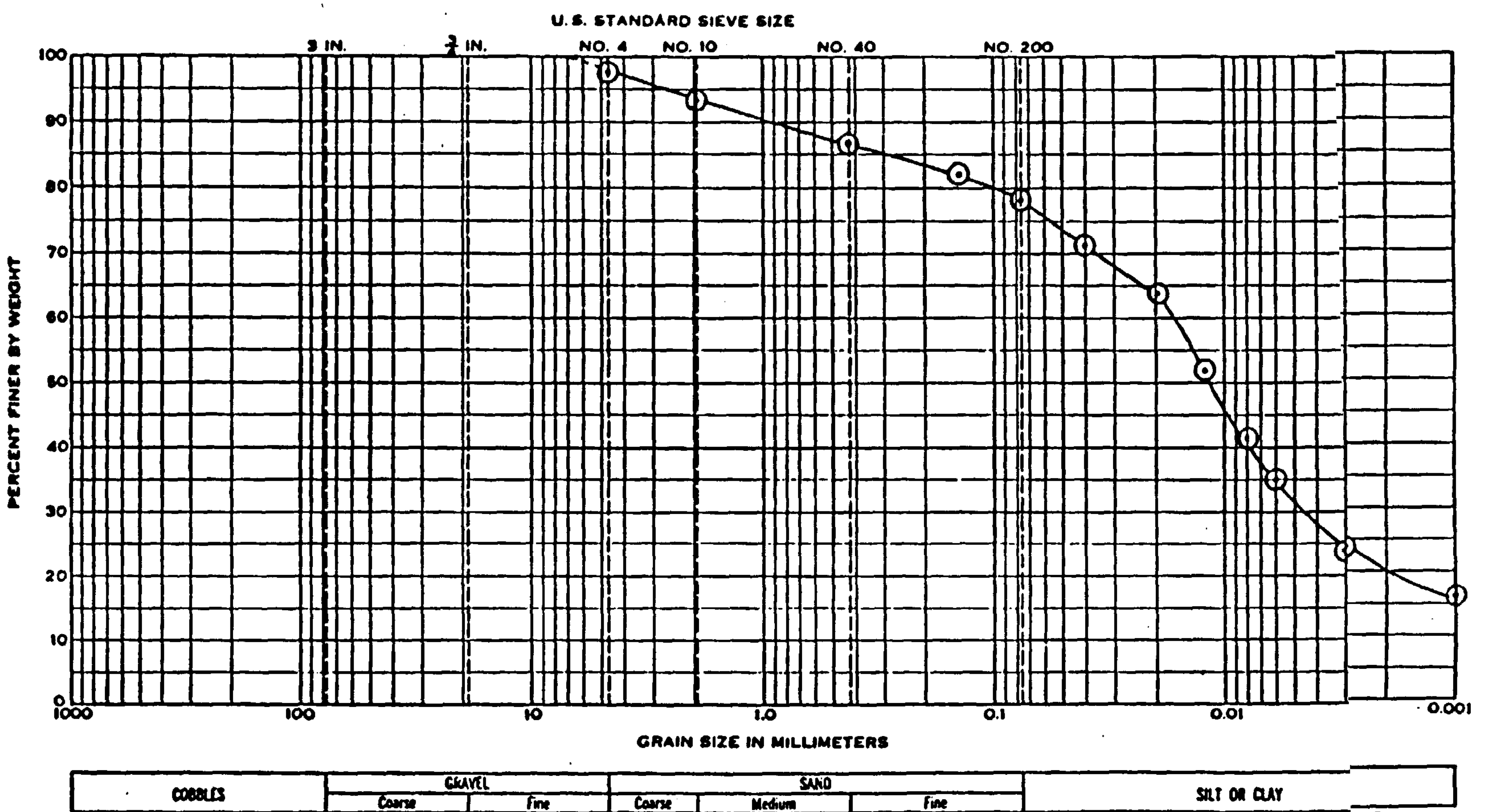
Test Hole: B-101

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9134.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
13	53.5'- 55.0'	(ML-CL)	14.0	25	18	7	

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

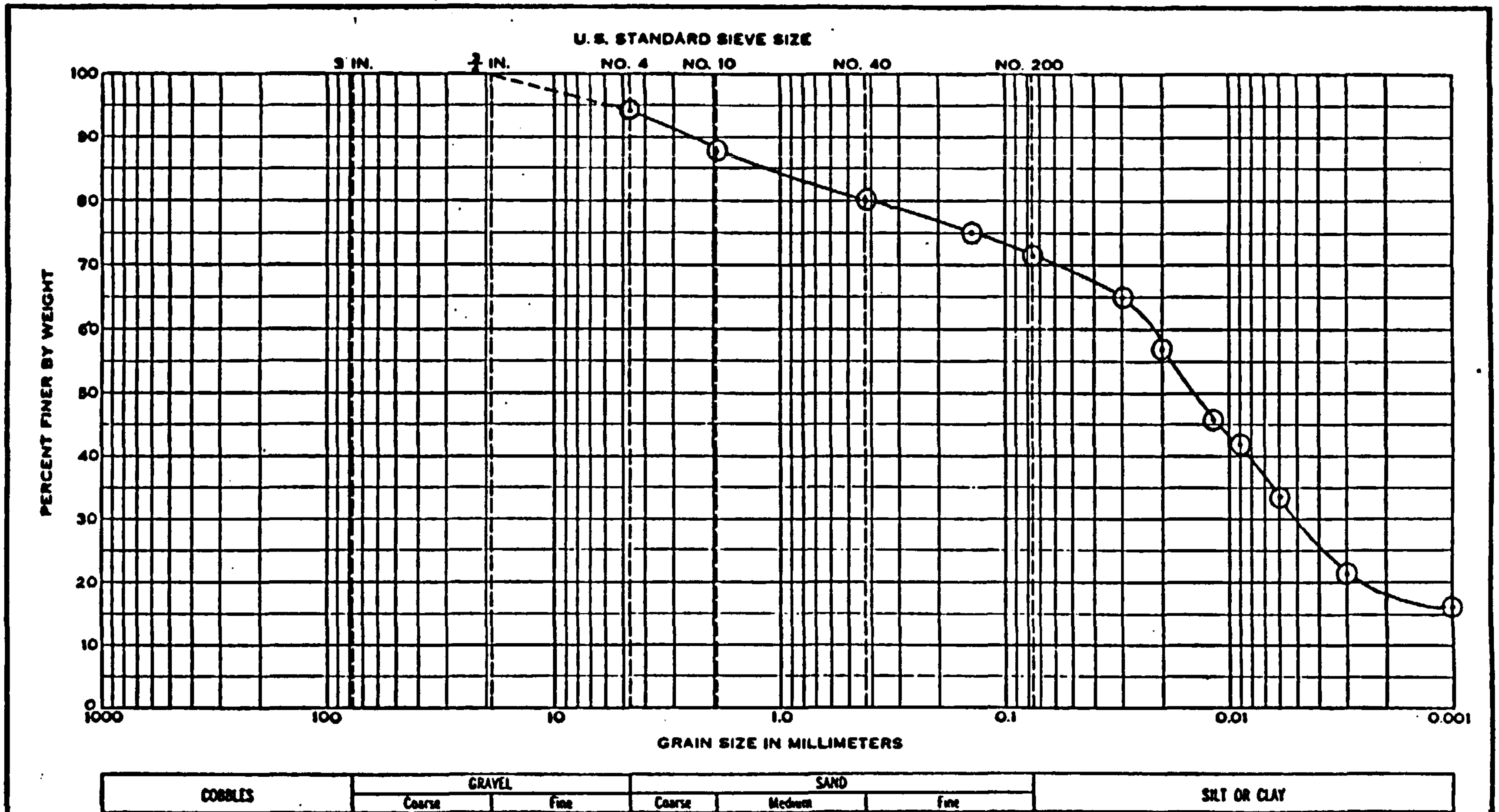
Test Hole: B-101

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
14	63.5'- 65.0'	(ML-CL)	10.4	24	17	7	

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

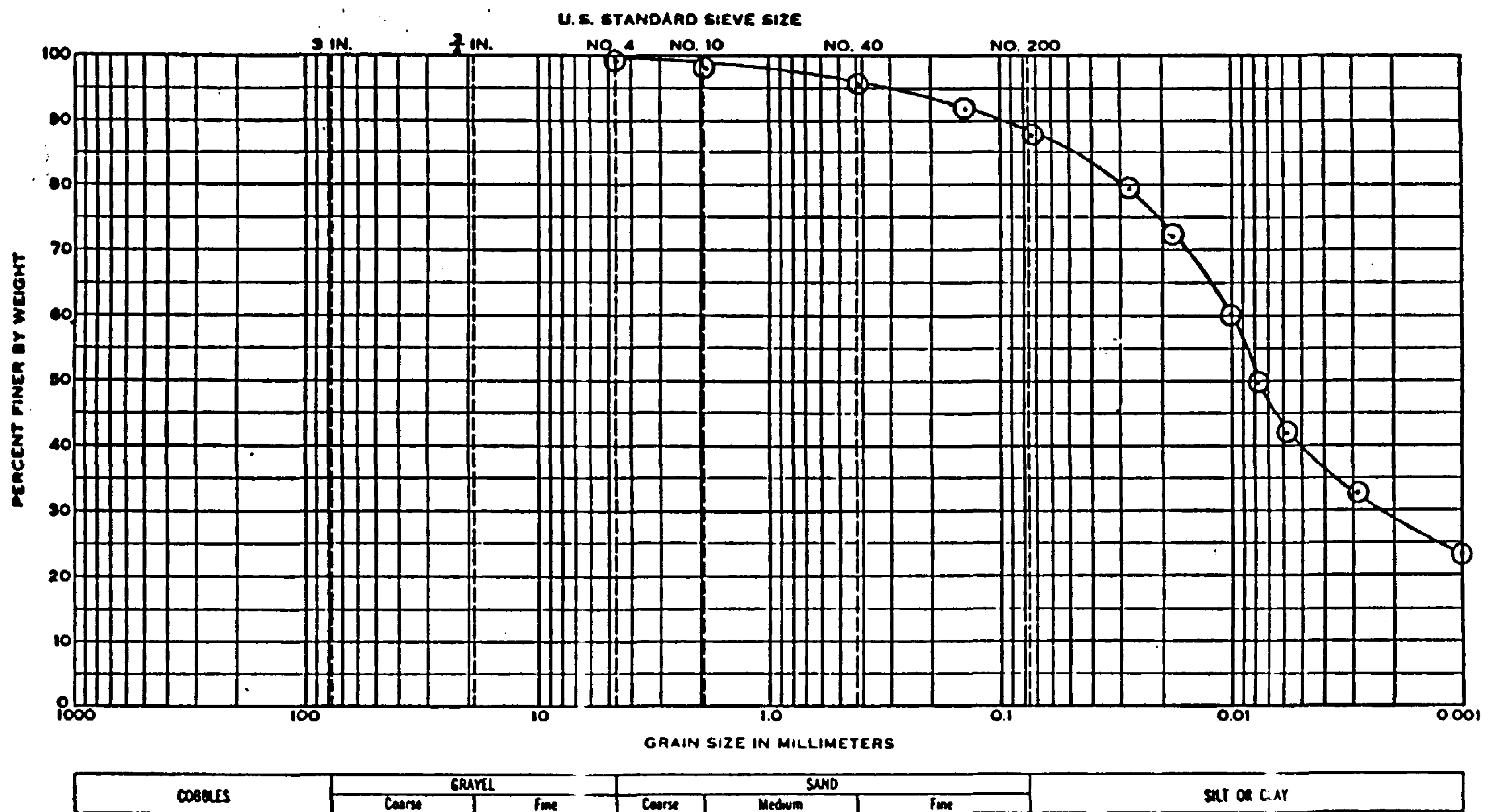
Test Hole: B-101

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
4	10.0'-	(CL)		33	18	15	
	12.0'						

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

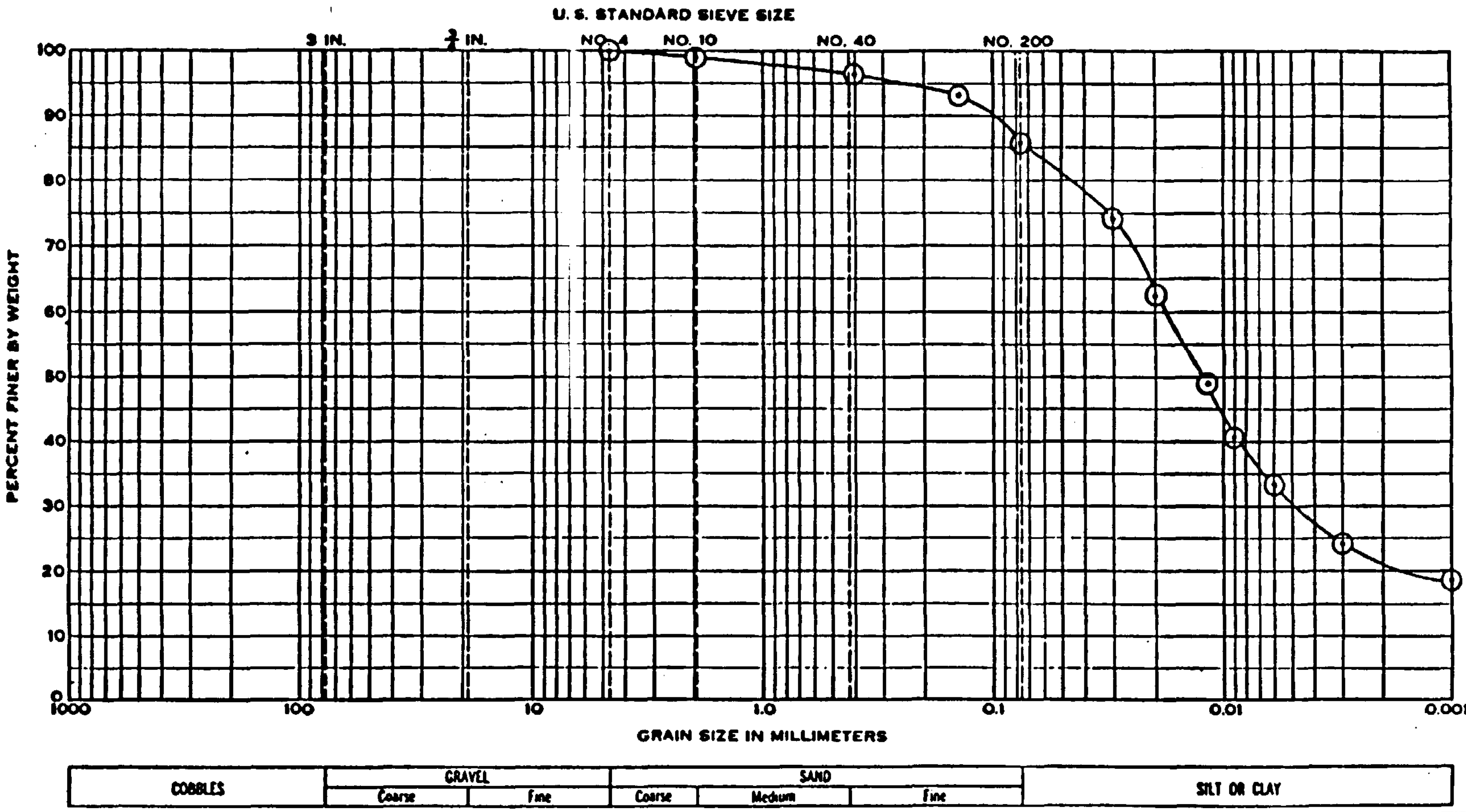
Test Hole: B-102

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9134.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
6	18.5'-20.0'	(CL)	19.9	28	20	8	

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

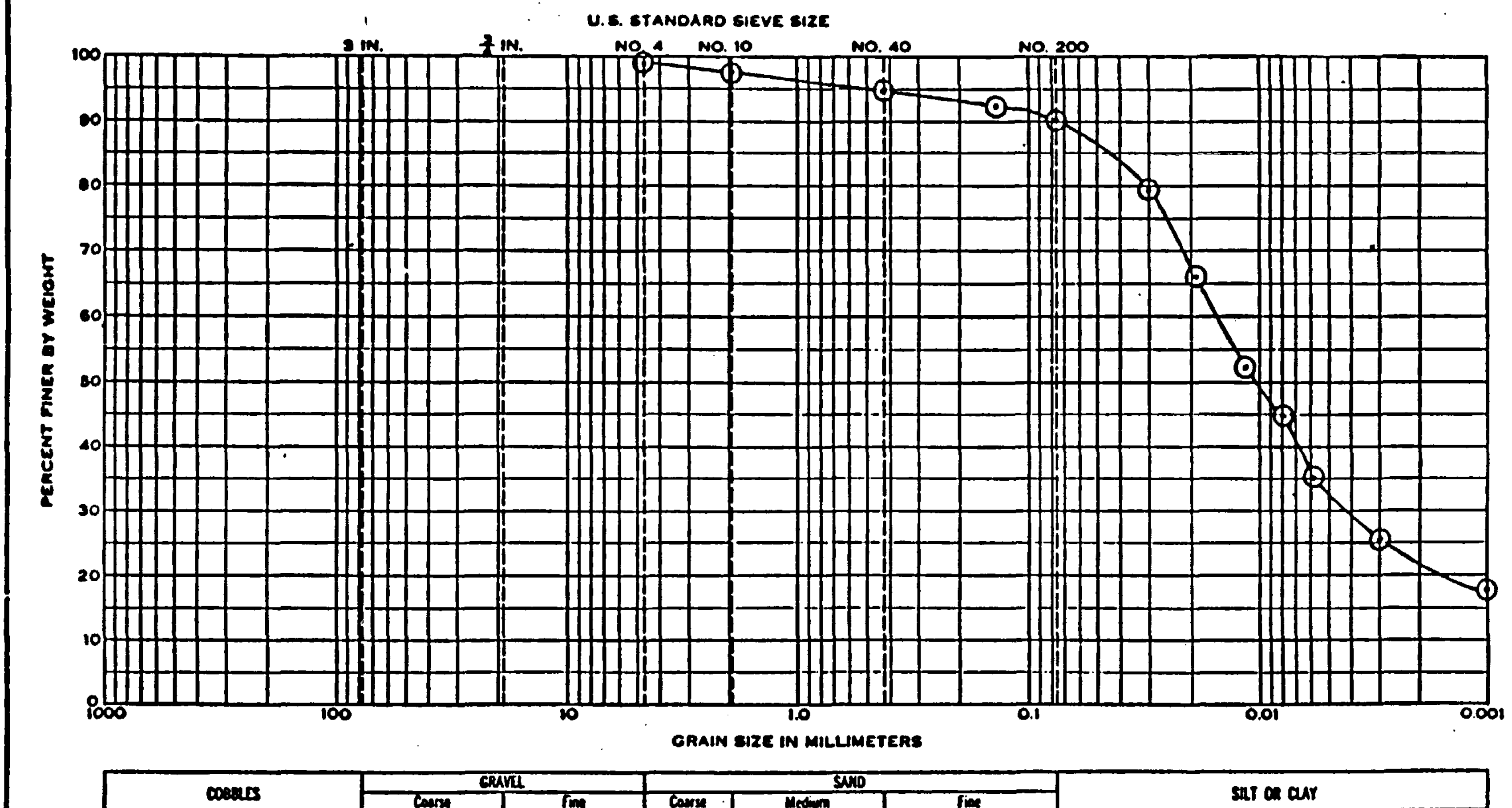
Test Hole: B-104

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
4	10.5'- 12.0'	(CL)	18.3	29	9	20	

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

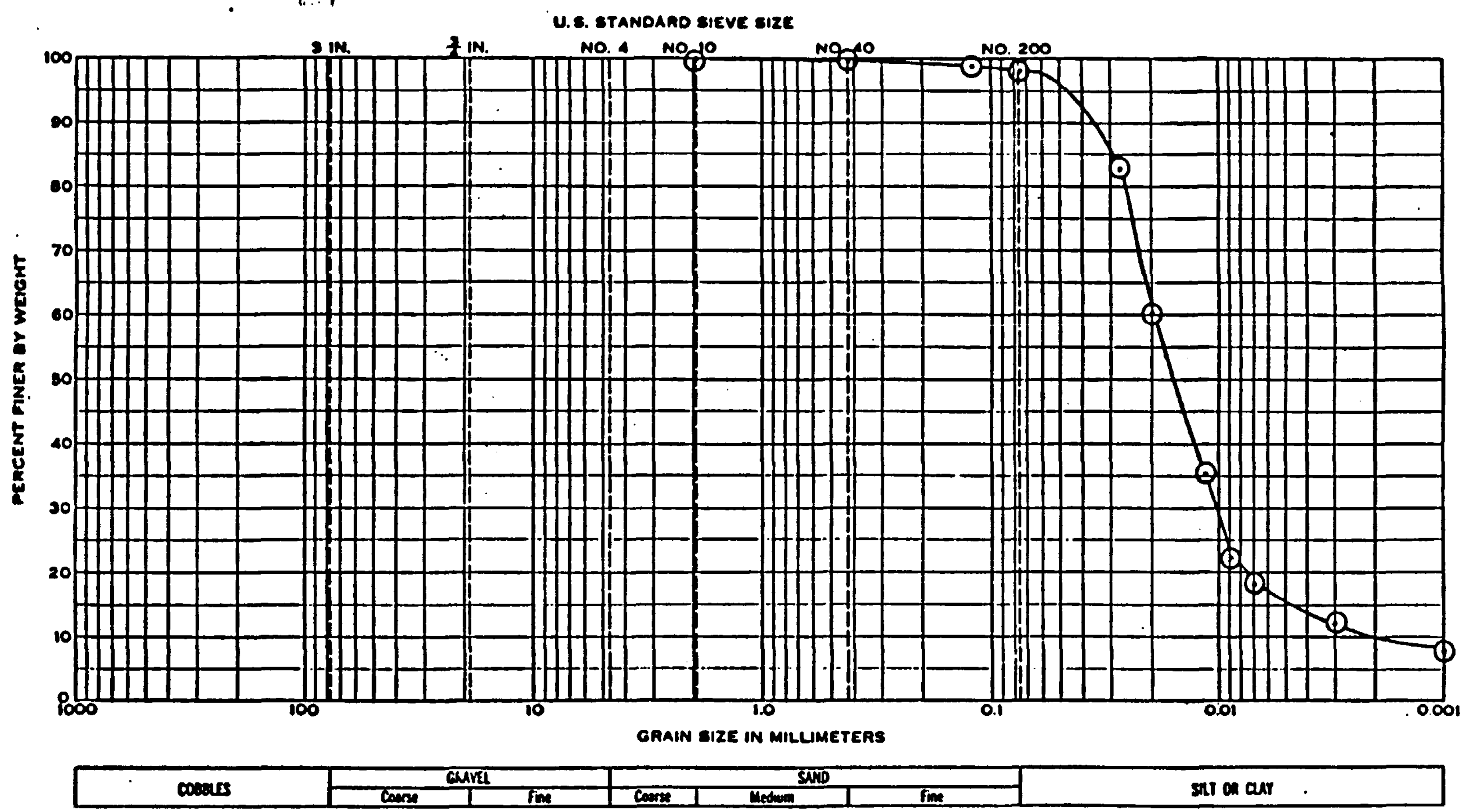
Test Hole: B-105

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
6	18.5'- 20.0'	(ML)	18.2				Non-Plastic

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

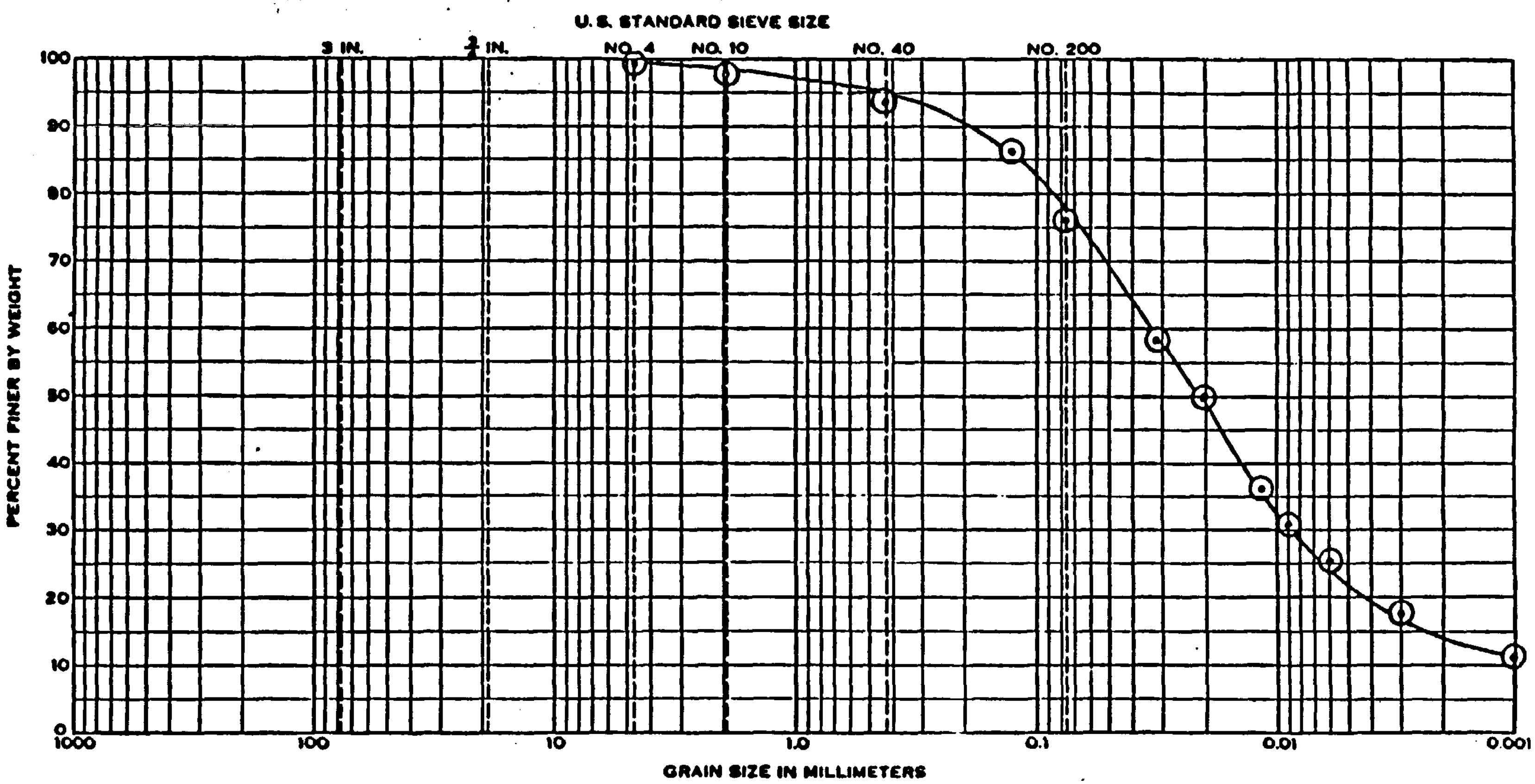
Test Hole: B-105

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
	6.5'	(OL)		33	25	8	

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Oh:

For: Engineering-Science, Ltd.

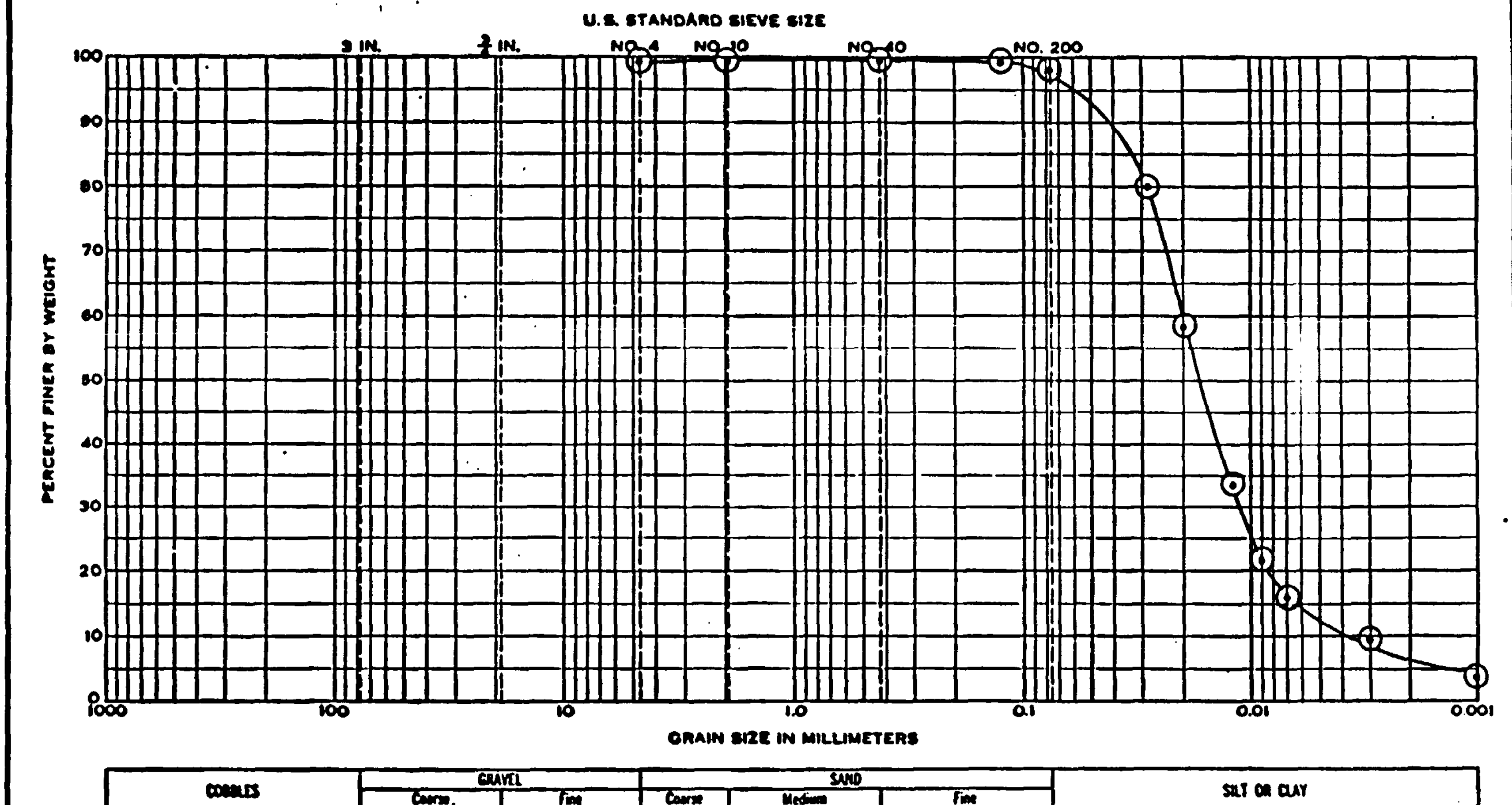
Test Hole: B-105A

HERRON TESTING LABORATORIES, INC.
ENGINEERS AND CHEMISTS
CLEVELAND 13, OHIO

File No.: M-9034.14

Date: 2-29-80

GRAIN SIZE DISTRIBUTION AND FIELD CONSTANTS



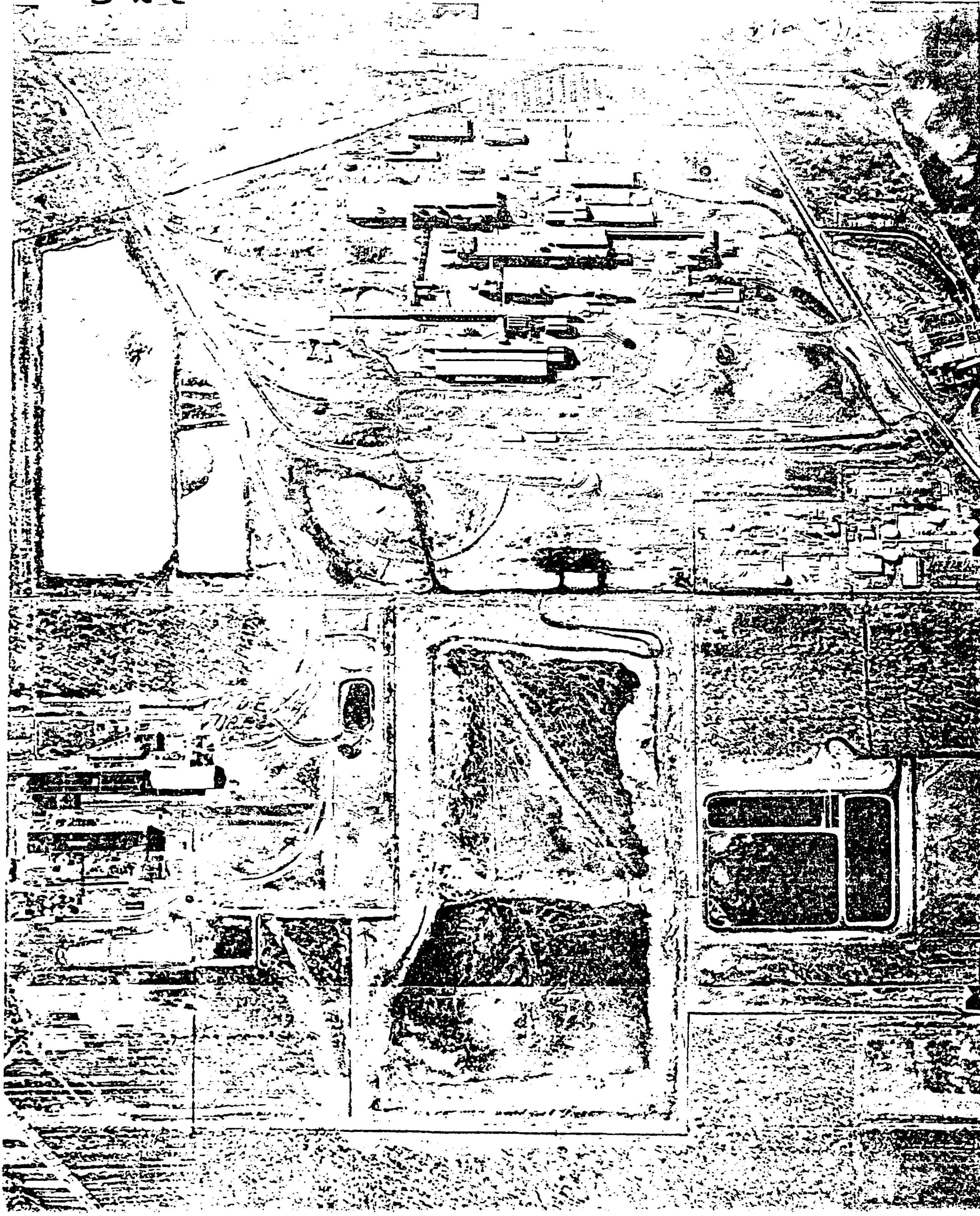
Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
	16.5'	(ML)					

Project: Monitoring of Well Installations - The Union Carbide Corporation - Ashtabula, Ohio

For: Engineering-Science, Ltd.

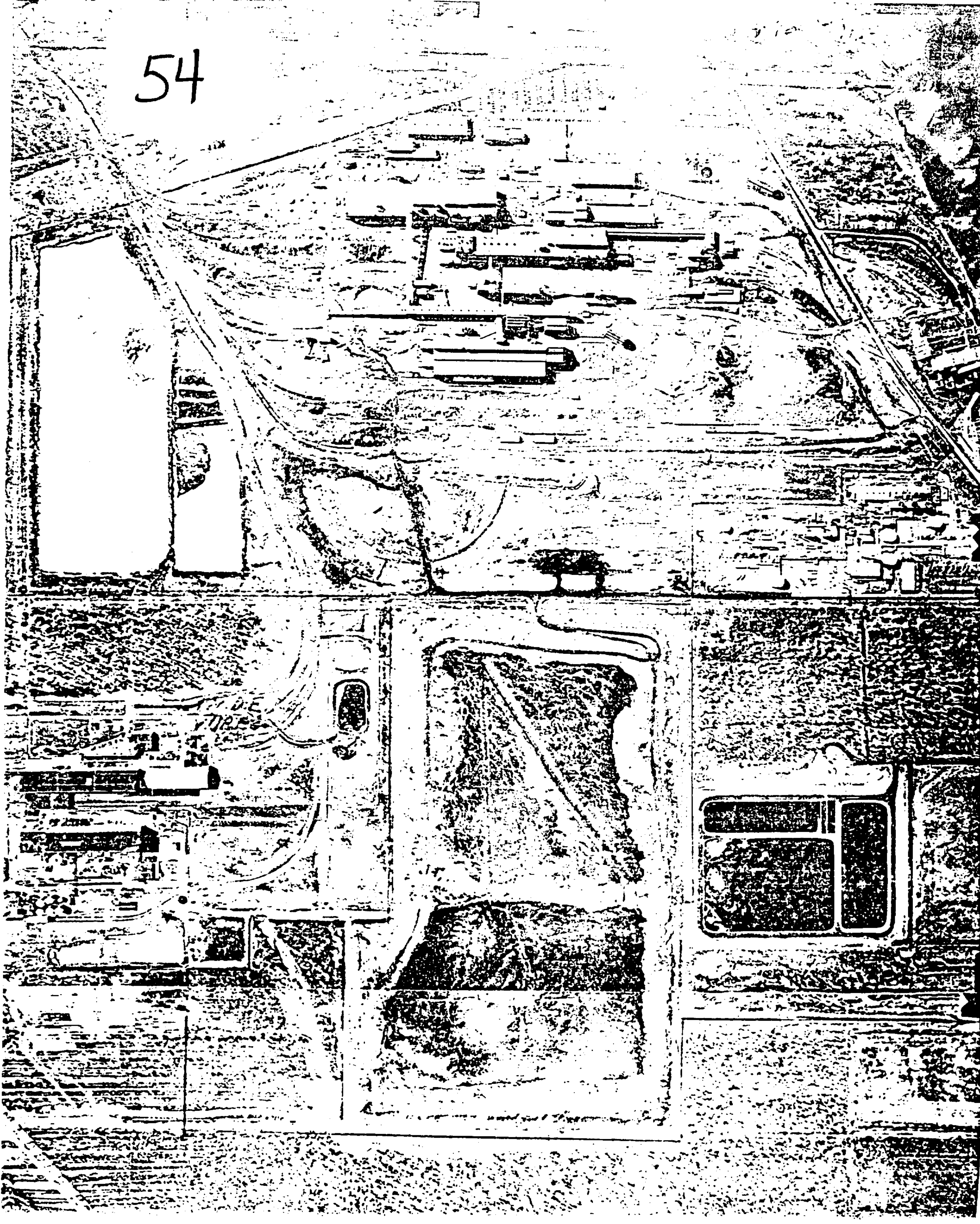
Test Hole: B-105A

3-2-0n



3-2-80

54



OhioEPA

55

REPORT ON PLANS FOR AN ADDITION TO THE INDUSTRIAL WASTEWATER TREATMENT SYSTEM AT ELKEM METALS, ASHTABULA

A Permit to Install application and plans were received in the Northeast District Office on September 10, 1985. The package consisted of drawings and specifications. Elkem is a producer of ferroalloys and calcium carbide, located on Lake Road in Ashtabula Township, Ashtabula County.

The existing wastewater treatment system was installed in 1977 and upgraded in 1980. Treatment consists of primary settling, breakpoint chlorination for phenols, alkaline chlorination for cyanide, neutralization, and final settling. Volume is approximately 3 MGD. Removed solids are currently being contained in an impoundment designated by Elkem as 3A, which is approaching capacity. The proposed impoundment, designated 5A, will provide future solids storage capacity.

The proposed impoundment will be constructed north of the existing treatment system. It will be 600 x 1,600 feet in area and be excavated 20 feet below existing grade. An embankment will be constructed 23 feet above existing grave with an exterior slope of 3:1 and an interior slope of 2.5:1. The outlet works will have three 1,100 GPM discharge pumps and a 24 inch diameter emergency spillway pipe. Both normal discharge and emergency overflow will be to the existing treatment system.

State of Ohio Environmental Protection Agency
Northeast District Office
2110 E. Aurora Road, Twinsburg, Ohio 44087 • (216) 425-9171

Construction is expected to be completed in 1986 at an estimated cost of $1,500.000. The project should qualify for tax exemption consideration. Approval is recommended, subject to the usual conditions.

Prepared by:

William T. Bush

William T. Bush, P.E.
District Engineer

10-7-85
Date

WTB:mjo
October 7, 1985

DATE: OCT 15 1981

UBJECT: Trip Report on Elkem Metals, Ashtabula, Ohio

57

FROM: David Homer David Homer
Environmental Scientist

TO: Eugene Meyer, Chief
Technical Programs Section

The Elkem Metals, Ashtabula, Ohio has requested U.S. Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA) to withdraw their Part A permit applications for their landfill. In June 1981, they began recycling their carbide shot waste, and do not presently use the landfill for hazardous waste, and also took the position that this carbide shot was not a "reactive waste" (D003) as designated on their Part A. The purpose of the visit was to meet with Elkem Metals representatives and gather information about the landfill and the characteristics of the waste, (visited the facility 9/22/81).

Attendees:

C. Robert Allenbach	Elkem Metals Co.
William R. Pioli	Elkem Metals Co.
W. Craig Miller	Elkem Metals Co.
J.T. Waller	Elkem Metals Co.
R.R. Gramroth	Elkem Metals Col
Debbie Berg	OEPA
Chris Flanery	OEPA
David Homer	USEPA

Mr. Allenbach explained that the waste listed in the Part A is generated during the manufacturing of calcium carbide (CaC_2). It is made by placing a carbon source and lime in a furnace, heating to a molten state, and then pouring into ingots. An impurity formed during the production process is a ferrosilicon metal, known as carbide shot.

The CaC_2 is then cooled, crushed, and the ferrosilicon material removed by magnetic separation. The carbide shot contains varying amounts of CaC_2 but averages approximately 0.6%. The carbide shot, prior to June 1981, was handled in one of three ways - 1) placed in closed barrels, 2) placed in open barrels, or 3) placed in a dump truck, and then taken to the facility's landfill. Mr. Waller said they treated the carbide shot before disposal. Treatment consisted of transporting the material to the landfill and exposing it to the air, enabling it to react with water vapor to produce acetylene and calcium hydroxide. A bulldozer crushed the barrels to expose the material to the atmosphere. Mr. Allenbach stated that occasionally when a bulldozer crushed a closed barrel, the barrel would go "poof" and he would not want to be standing on it when it went "poof".

Samples of the carbide shot were analyzed to determine the average acetylene generated per pound. The USEPA and OEPA received a copy of the analysis report.

The disposal areas identified in the Part A are called Pond 3 and 3A. Presently Pond 3A is part of the waste water treatment facility and Pond 3 is the landfill, which has been closed and covered. No closure plan has been filed with Region V USEPA or OEPA.

The material in Pond 3 originated from various sources: Union Carbide Metals - Elkem Metals, Linde Gas and Linde Wire. Mr. Allenbach estimates that 1-2% of the material in Pond 3 is carbide shot. The material was randomly placed in the landfill (Pond 3). Elkem Metals estimated that they disposed 615 tons of carbide shot in the landfill since November 19, 1980.

After reviewing the data and based upon conversations with Elkem Metals personnel, it is my conclusion that the carbide shot would meet the characteristic of a reactive hazardous waste [40 CFR 261.23(3)(4) and (6)].

Since the waste is reactive they cannot withdraw their Part A. Also, two major RCRA violations are evident - 1) landfilling of a reactive waste, and 2) failure to submit a closure plan 180 days before closure begins.

cc: Dan Banaszek
Kathleen Homer
Hak Cho

58 EPA **Notification of Hazardous Waste Site**

United States Environmental Protection Agency Washington DC 20460

This initial notification information is required by Section 103(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and must be mailed by June 9, 1981.

Please type or print in ink. If you need additional space, use separate sheets of paper. Indicate the letter of the item which applies.

OH #900 OHS-000-001-1117

A Person Required to Notify:
Enter the name and address of the person or organization required to notify.

Name UNION CARBIDE CORPORATION
Street 270 PARK AV
City NEW YORK State N.Y. Zip Code 10017

B Site Location:
Enter the common name (if known) and actual location of the site.

Name of Site UNION CARBIDE-LINDE WELDING MATLS. PLT.
Street MIDDLE ROAD
City ASHTABULA County ASHTABULA State OH Zip Code 44004

OHD000821454

C Person to Contact:
Enter the name, title (if applicable), and business telephone number of the person to contact regarding information submitted on this form.

Name (Last, First and Title) PARKER, JR. H.M. TECHNICAL MANAGER
Phone (218) 551-4515

D Dates of Waste Handling:
Enter the years that you estimate waste treatment, storage, or disposal began and ended at the site.

From (Year) A 1963 B 1963 To (Year) 1972 1977

E Waste Type: Choose the option you prefer to complete

Option I: Select general waste types and source categories. If you do not know the general waste types or sources, you are encouraged to describe the site in Item I—Description of Site.

General Type of Waste:
Place an X in the appropriate boxes. The categories listed overlap. Check each applicable category.

1. ☐ Organics
2. ☐ Inorganics
3. ☐ Solvents
4. ☐ Pesticides
5. ☒ Heavy metals
6. ☒ Acids
7. ☒ Bases
8. ☐ PCBs
9. ☐ Mixed Municipal Waste
10. ☐ Unknown
11. ☐ Other (Specify)

Source of Waste:
Place an X in the appropriate boxes.

1. ☐ Mining
2. ☐ Construction
3. ☐ Textiles
4. ☐ Fertilizer
5. ☐ Paper/Printing
6. ☐ Leather Tanning
7. ☐ Iron/Steel Foundry
8. ☒ Chemical, General
9. ☒ Plating/Polishing
10. ☐ Military/Ammunition
11. ☐ Electrical Conductors
12. ☐ Transformers
13. ☐ Utility Companies
14. ☐ Sanitary/Refuse
15. ☐ Photofinish
16. ☐ Lab/Hospital
17. ☐ Unknown
18. ☐ Other (Specify)

Option 2: This option is available to persons familiar with the Resource Conservation and Recovery Act (RCRA) Section 3001 regulations (40 CFR Part 261).

Specific Type of Waste:
EPA has assigned a four-digit number to each hazardous waste listed in the regulations under Section 3001 of RCRA. Enter the appropriate four-digit number in the boxes provided. A copy of the list of hazardous wastes and codes can be obtained by contacting the EPA Region serving the State in which the site is located.

000826 JUN -9 81

RECEIVED
JAN 11 1984
OHIO ENVIRONMENTAL PROTECTION AGENCY
N. E. D. O.

Form Approved
OMB No. 2000-0138

EPA Form 8900-1

Notification of Hazardous Waste Site · Side Two

F Waste Quantity:

Place an X in the appropriate boxes to indicate the facility types found at the site.

In the "total facility waste amount" space give the estimated combined quantity (volume) of hazardous wastes at the site using cubic feet or gallons.

In the "total facility area" space, give the estimated area size which the facilities occupy using square feet or acres.

Facility Type

1. ☐ Piles
2. ☒ Land Treatment
3. ☐ Landfill
4. ☐ Tanks
5. ☒ Impoundment
6. ☐ Underground Injection
7. ☐ Drums, Above Ground
8. ☐ Drums, Below Ground
9. ☐ Other (Specify) ______

Total Facility Waste Amount

cubic feet ______

gallons ______

Total Facility Area

square feet ______

acres ______

G Known, Suspected or Likely Releases to the Environment:

Place an X in the appropriate boxes to indicate any known, suspected, or likely releases of wastes to the environment.

☐ Known ☐ Suspected ☐ Likely ☒ None

Note: Items H and I are optional. Completing these items will assist EPA and State and local governments in locating and assessing hazardous waste sites. Although completing the items is not required, you are encouraged to do so.

H Sketch Map of Site Location: (Optional)

Sketch a map showing streets, highways, routes or other prominent landmarks near the site. Place an X on the map to indicate the site location. Draw an arrow showing the direction north. You may substitute a publishing map showing the site location.

I Description of Site: (Optional)

Describe the history and present conditions of the site. Give directions to the site and describe any nearby wells, springs, lakes, or housing. Include such information as how waste was disposed and where the waste came from. Provide any other information or comments which may help describe the site conditions.

(See Form ATTached)

J Signature and Title:

The person or authorized representative (such as plant managers, superintendents, trustees or attorneys) of persons required to notify must sign the form and provide a mailing address (if different than address in item A). For other persons providing notification, the signature is optional. Check the boxes which best describe the relationship to the site of the person required to notify. If you are not required to notify check "Other".

Name ______

Street ______

City ______ State ______ Zip Code ______

Signature ______ Date ______

☒ Owner, Present
☒ Owner, Past
☐ Transporter
☒ Operator, Present
☒ Operator, Past
☐ Other

LISTING BY FACILITY
REGION: 05 STATE: OH

NOTIFICATION ID NO.	SITE NAME / SITE STREET / SITE CITY / SITE COUNTY / EPA SITE ID NO.		REQUIRED NOTIFIER NAME / REQUIRED NOTIFIER STREET / REQUIRED NOTIFIER CITY / (CONTACT NAME/TITLE) / (CONTACT PHONE)	STATE	ZIP	NOTIFIER STATUS (PRES OWN, PAST OWN, PRES OP, PAST OP, TRANSPORTER, VOLUNTEER)
OHS000001447	LINDE WELDING MATLS. PLANT MIDDLE ROAD ASHTABULA ASHTABULA OHD000821454	44004	UNION CARBIDE CORP. 270 PARK AVE. NEW YORK (PARKER DR H M TECHNICAL MGR) (212-551-4515)	NY	10017	PRES OWN PAST OWN PRES OP

RELEASES TO THE ENVIRONMENT: NONE

DATES OF WASTE HANDLING: 1963 TO 1977

WASTE AMOUNT: 2,250 CU FT

AREA: 4,500 SQ FT

MAP PRESENT: YES

FORM TYPE: NON STANDARD

NOTIF. POSTMARKED DATE: 81/06/09

SIGNATURE PRESENT: YES

DATE OF LAST UPDATE: 82/02/02

TYPE OF FACILITY	TYPES OF WASTES	SOURCES OF WASTE
LANDFILL IMPOUNDMENT	HEAVY METALS ACIDS BASES	CHEMICALS, GENERAL PLATING/POLISHING

COMMENTS	SEQ NO.
REFERENCE TO WASTE HANDLING DATES: A)	1
1963-1972 B)1963-1977./REFERENCE TO	2
WASTE AMOUNT: A)2250 CU FT B)6MM/REFER-	3
ENCE TO FACILITY AREA: A)4500 SQ FT B)	4
1.1MM/REFERENCE TO SITE LOCATION: A)PLOT	5
PLAN A,DATED 5/10/81,SHOWING LINDE & DE-	6
TREX (NOW INC,INC) PROPERTY. B)PLOT PLAN	7
B,DATED 5/12/81,SHOWING SLUDGE DRYING	8
BED #1,& EXTENSION LOCATED W. OF PLANT	9
SITE ON UNION CARBIDE METALS DIV PROPER-	10
TY./DESCRIPTION OF SITE: A)APPROX. 900	11

Linde Welding

D. J. Berg

GROUNDWATER QUALITY ASSESSMENT PLAN
(October 1985)

59

Prepared for

L-TEC
WELDING AND CUTTING SYSTEMS
ASHTABULA, OHIO

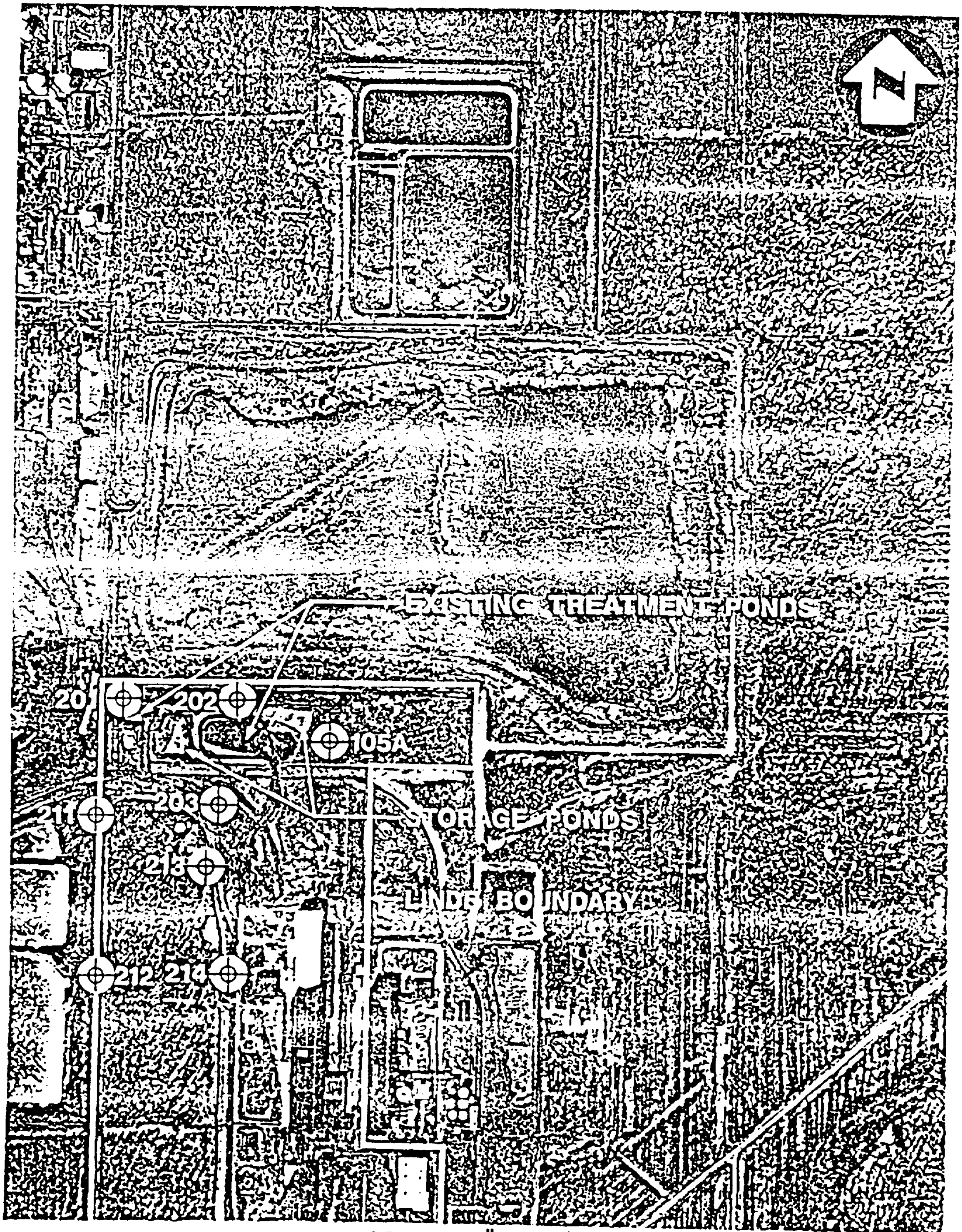
Prepared by

ENGINEERING-SCIENCE, INC.
19101 Villaview Road - Suite 301
Cleveland, Ohio 44115

RECEIVED
OCT 29 1985
OHIO EPA-N.E.D.O.

8510DDP/1:10

MONITORING WELL LOCATIONS



SCALE: 1" = 660'

LEGEND:
⊕ MONITORING WELLS

LINDE WELDING PRODUCTS
ASHTABULA, OHIO

FIG. 1

SECTION 1
CURRENT SITUATION

INTRODUCTION

The L-TEC Welding and Cutting Systems, formerly the Linde Welding Products Division of Union Carbide Corporation, operates a facility which produces a variety of welding wire for use by automated and manual welding equipment. Process operations result in lime stabilized sludges which are stored in on-site surface impoundments. The sludges have been listed as hazardous wastes F006 and K062. The hazardous wastes were listed for the following constituents:

cadmium
hexavalent chromium
nickel
cyanide
lead

A groundwater monitoring program was developed and instituted at this facility, as required by 40 CFR 265 Subpart F, Standards for Owners and Operators of Hazardous Waste Facilities; Ground Water Monitoring. A report describing the groundwater monitoring program (Linde Welding Products, 1982) has been submitted to Ohio EPA.

Groundwater samples were collected and analyzed for indicators of groundwater contamination. Samples from downgradient wells have shown statistically significant increases in pH and sometimes electrical conductance and TOX. When the groundwater was resampled, statistically significant increases were again detected. As specified under 40 CFR 265.93(d)(2), L-TEC is required to develop a Groundwater Quality Assessment Plan. This report presents the Groundwater Quality Assessment Plan.

EXISTING GROUNDWATER MONITORING PROGRAM

A system of five monitoring wells and three additional water level observation wells have been installed at the L-TEC facility. The location of these wells are shown on Figure 1. The well construction details and geologic profile for each well are presented in APPENDIX A. The monitoring wells include one upgradient well (#214) and four downgradient wells (#105A, #201, #202 and #203). Water levels in well #211, #212, and #213

SECTION 2

TECHNICAL APPROACH

GROUNDWATER QUALITY ASSESSMENT PROGRAM

The groundwater quality assessment program presented herein is intended to meet all applicable state and federal requirements, as promulgated by RCRA and its amendments.

The assessment program will result in following:

(1) Identification of whether or not hazardous wastes or hazardous waste constituents have entered underlying groundwater, and their respective concentrations.

(2) Identification of the rate of migration of these constituents through the groundwater system.

(3) Identification of the lateral and vertical extent of any such contamination, if present.

(4) Development of required program for corrective action, if necessary.

(5) Development of a groundwater monitoring program to comply with routine monitoring, and if necessary, to identify effectiveness of corrective actions.

(6) Report preparations detailing findings, conclusions, and recommendations from the assessment program.

In order to achieve the above objectives, the following staged investigation has been developed. It is clear that a continuous relationship must be maintained with the Ohio Environmental Protection Agency, Federal EPA, and the L-TEC Facility.

TASK I: PRELIMINARY INVESTIGATION

The groundwater quality assessment program has become necessary because statistically significant increases (or pH decreases) have been found in the indicator parameters. It has now become necessary to determine whether these "indicator" changes have been caused by hazardous waste or waste constituents entering the groundwater as a result of L-TEC operations. This first major objective will be achieved by conducting the following subtasks:

(I.1) Assess the surrounding ponds to identify the broad characteristics of these ponds or other adjacent activities which would be responsible for the changes and whether they are temporary or permanent influences.

(I.2) Obtain water levels and representative water quality samples from all existing site wells (5 monitoring wells and 3 observation wells) on a monthly basis for four consecutive months.

(I.3) Analyze the water samples for (the samples shall be split and sent to two different laboratories):

- pH
- specific electrical conductance
- TOC
- TOX
- Lead
- Copper
- Nickel
- Cyanide
- Cadmium
- Hexavalent chromium
- Manganese

(I.4) Perform in-situ hydraulic conductivity tests by instantaneous (slug) procedures on the 4 monitoring wells, and on any of the observation wells which have been completed in different sediments.

The above water quality information will be used to develop an initial background arithmetic mean for those hazardous constituents (of the wastes) which has not yet been done. The data from the upgradient well(s) will be used to provide this statistical base from which to compare all downgradient wells.

The preliminary investigation will provide the data necessary to determine whether hazardous waste or hazardous waste constituents are present in the groundwater. If they are not found, semi-annual monitoring will be reinstituted. If they are found, the extent of vertical and lateral contamination will be identified. The hydraulic conductivity and hydraulic gradient information developed in Task I will be used to determine the rate and direction of migration.

If Task I does not result in the adequate identification of the extent of contamination, additional wells will be installed as part of Task II activities.

TASK II: ADDITIONAL WELL INSTALLATIONS

This task will be conducted if the extent of contamination cannot be identified from Task I. Although it cannot now be determined how many additional wells would be needed, the loction and construction details of new wells would be reviewed with OEPA. Actual subtasks will include:

(II.1) Install (and survey) additional wells required to identify the extent of hazardous waste constituents in the groundwater.

(II.2) Obtain water levels and water samples from these wells and other selected existing wells immediately after installation.

(II.3) Analyze water samples for all the listed indicators.

TASK III: DEVELOPMENT OF CORRECTIVE ACTION PROGRAM

If hazardous waste constituents have been verified to be present in groundwater, an engineering feasibility study will be initiated. This study will provide alternatives for the prevention of hazardous waste constituents in the groundwater from exceeding specified levels at the compliance point. A proposed corrective action program will be submitted to the regulatory agencies within 6 months of the verification.

The program will consider alternatives for groundwater removal such as pumping wells, interception trenches, and/or cut-off walls, or other methods for treatment in place. Included will be an effectiveness monitoring program and schedule of implementation. The decision rationale for formulating all proposed facets of the program will be explained in detail.

TASK IV: REPORTING

This task provides for required reporting to the state and/or federal regulatory agencies. Water quality information will be submitted to the OEPA four weeks after each sampling. A report summarizing all components of the assessment program will be submitted to the OEPA, six months after the first sampling (see Schedule). If it is necessary to develop a corrective action program, it will be submitted six months after verification of hazardous constituents in the groundwater.

The assessment program report will include:

- data analysis/presentation
- develop a future monitoring plan in the event that groundwater contamination has occurred,
- in the event that no groundwater contamination is found, a monitoring program will be recommended.

Data analysis and presentation will include hydrogeologic and water quality characterization. Hydrogeologic characterization will include the following data presentations:

- water table map of the site, indicating groundwater flow direction,
- hydrogeologic cross-sections from the well boring records, defining the water-table aquifer.

Water quality characterization will include the following data presentations:

- areal variation of indicator parameters: maps of monitoring well concentrations,
- temporal variation of indicator parameters: graphs of the variation of concentrations at each well with time.

All of the data accumulated from the groundwater quality assessment plan and the prior groundwater monitoring program will be utilized for the data presentations.

If hazardous waste constituent contamination has not occurred, then a monitoring program of semi-annual sampling of the monitoring wells will be recommended. This monitoring program would continue to monitor for the indicator parameters and it would be similar to the groundwater monitoring program, using the statistical evaluation described under Task 3. If hazardous waste or hazardous waste constituents have been found to be present in the groundwater, a compliance program will be developed and consist of continued quarterly sampling of the monitoring and observation wells. As a minimum, groundwater samples will be analyzed for the following constituents:

Chloride	Phenols
Iron	Sodium
Lead	Sulfate
Manganese	TOC
Specific Conductance	Total Organic Halogen
pH	Cadmium
Hexavalent Chromium	Nickel
Cyanide	Copper

(groundwater surface elevation to be recorded with each sample)

The rate, extent, and concentration of any hazardous waste constituents will be determined as a part of such investigation.

If necessary, a corrective action program report will be developed and submitted to the regulatory agency. The program will identify all appropriate alternatives, provide test data or other information necessary to support the proposed selection.

INVESTIGATIVE PROCEDURES

Sampling and Analyses

Sampling and analysis activities will adhere to proper methods and procedures. Monitoring and observation wells will be developed properly in order to prepare them for sampling, allowing several volumes of fresh aquifer water to enter the well casings. Sampling will be performed by use of dedicated bottom-charging PVC bailers. These devices are relatively inexpensive, reliable, and will help to minimize the possibility of cross-contamination between wells. Sampling will be performed in accordance with standard groundwater monitoring procedures (Scalf and others, 1981). Sample preservation and analyses will be performed in accordance with USEPA guidelines for quality assurance/quality control (USEPA, 1983). Water sample analysis will be performed by EPA-approved laboratories.

Groundwater elevations will be determined in monitoring and observation wells at the time of each sampling. Changes in the groundwater flow regime, will be evaluated annually. This will ensure the proper placement of upgradient and downgradient groundwater sampling locations.

Statistical Analyses

The objective of groundwater monitoring is to detect significant increases in contaminant indicator parameters. The standard statistical evaluation procedure is Cochran's approximation to the Behrens-Fisher Student's T-test (40 CFR, Part 264, Appendix IV). This procedure will be used for this assessment and is described in APPENDIX B.

SECTION 3

ASSESSMENT SCHEDULE

The initial step in this program is the OEPA review and approval of this groundwater quality assessment plan. It is assumed for the purposes of this scheduling that approval will require approximately two weeks. Upon notification from OEPA to proceed, the assessment program will begin.

As shown on Figure 2, the Preliminary Investigation will be performed over a ten month period. The first statistical comparison will be made when results are obtained for the fifth sampling of the six indicator parameters. These results will be used to identify if hazardous constituents are present and whether their extent can be shown. Any additional wells will be installed and sampling will take place as soon as possible. All data collected to this point will be analyzed and presented. If necessary, the corrective action plan will be developed and submitted 6 months after the first statistical comparison which shows that hazardous waste constituents have been found in downgradient wells.

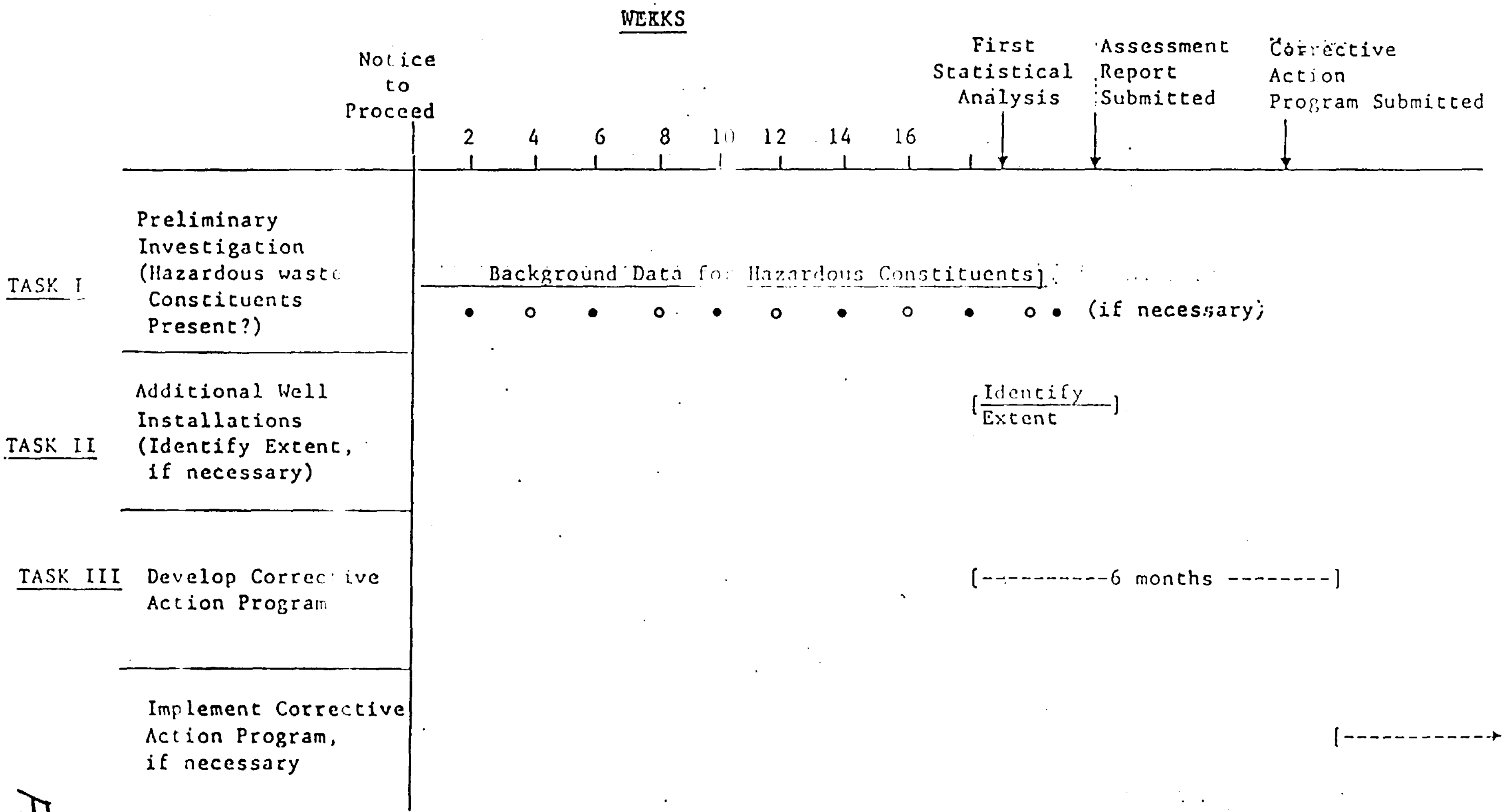


FIG 2

GROUNDWATER QUALITY ASSESSMENT PROGRAM
IMPLEMENTATION SCHEDULE

• Samples Obtained
o Analyses Submitted

FIGURE 2

REFERENCES

Scalf, M. R. and others, 1981. Manual of Groundwater Quality Sampling Procedures. USEPA/NWWA Cooperative Series.

U.S. Environmental Protection Agency, Groundwater Monitoring Guidance for Owners and Operators of Interim Status Facilities, SW-963, (Washington, DC: Office of Solid Waste and Emergency Response, EPA, March 1983).

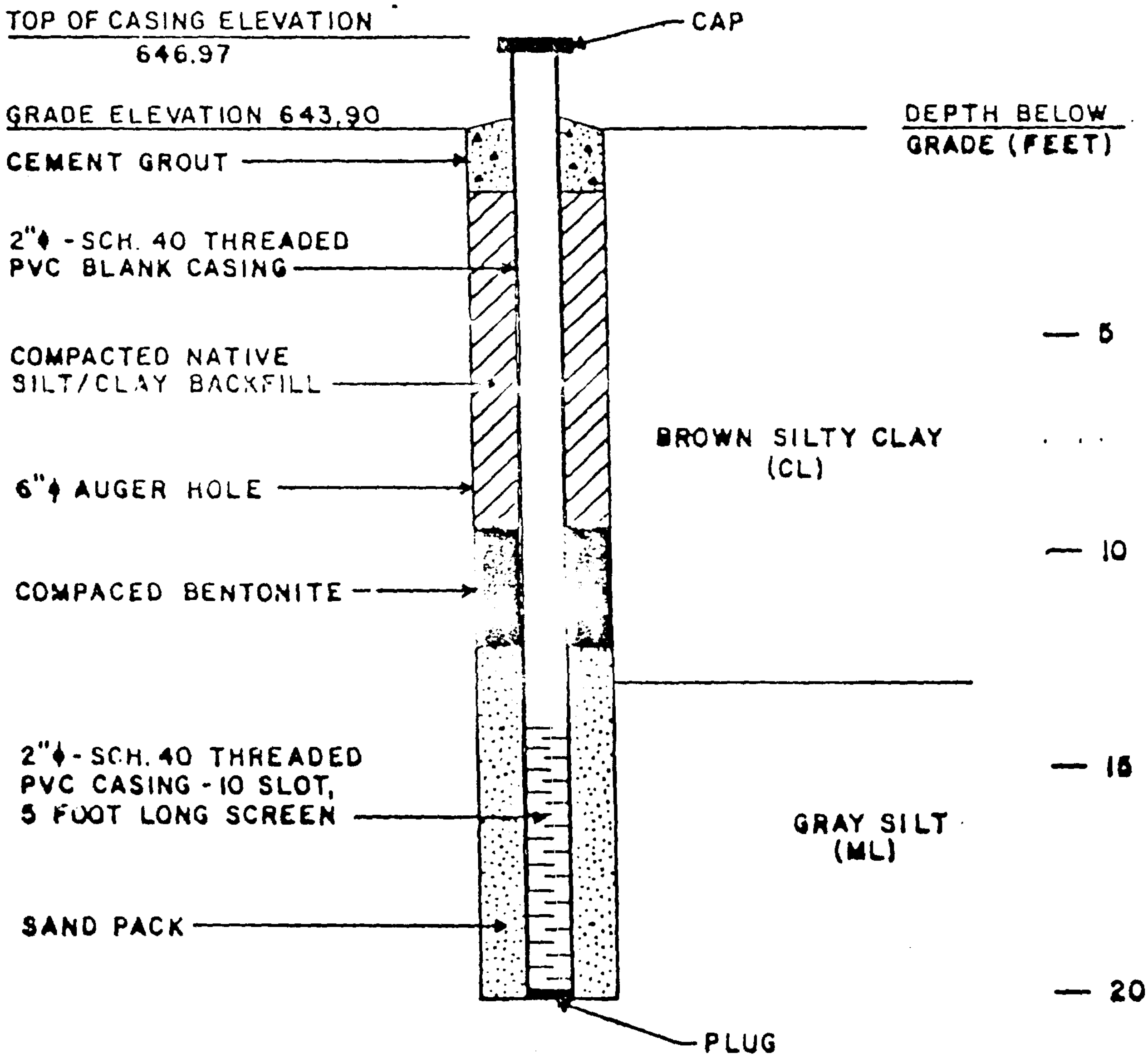
APPENDIX A

MONITORING WELL CONSTRUCTION DIAGRAMS

MONITORING WELLS CONSTRUCTION DIAGRAMS

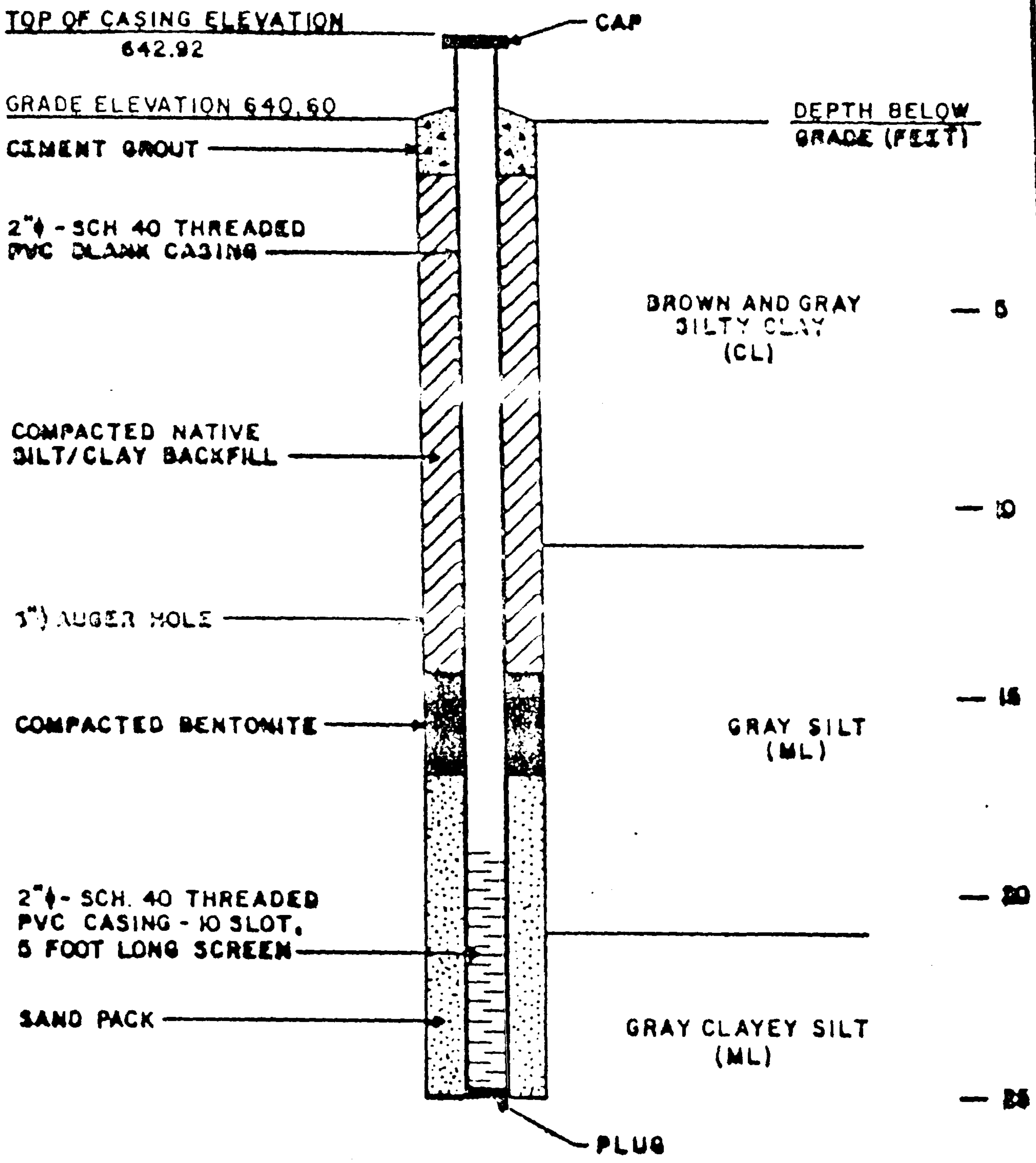
(casing elevations corrected January 1983)

WELL
105-A



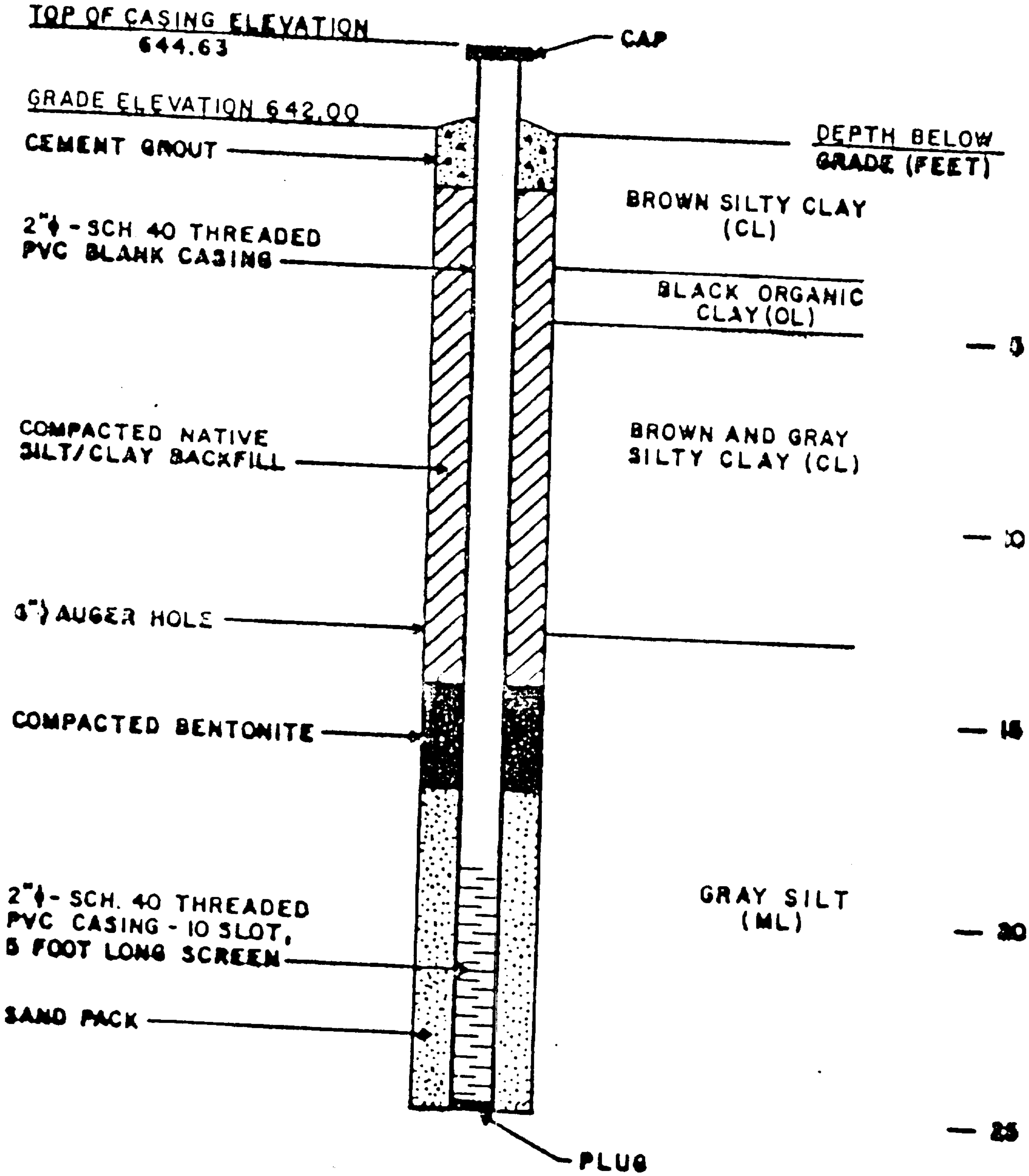
MONITORING WELL
CONSTRUCTION
LINDE WELDING

WELL
201



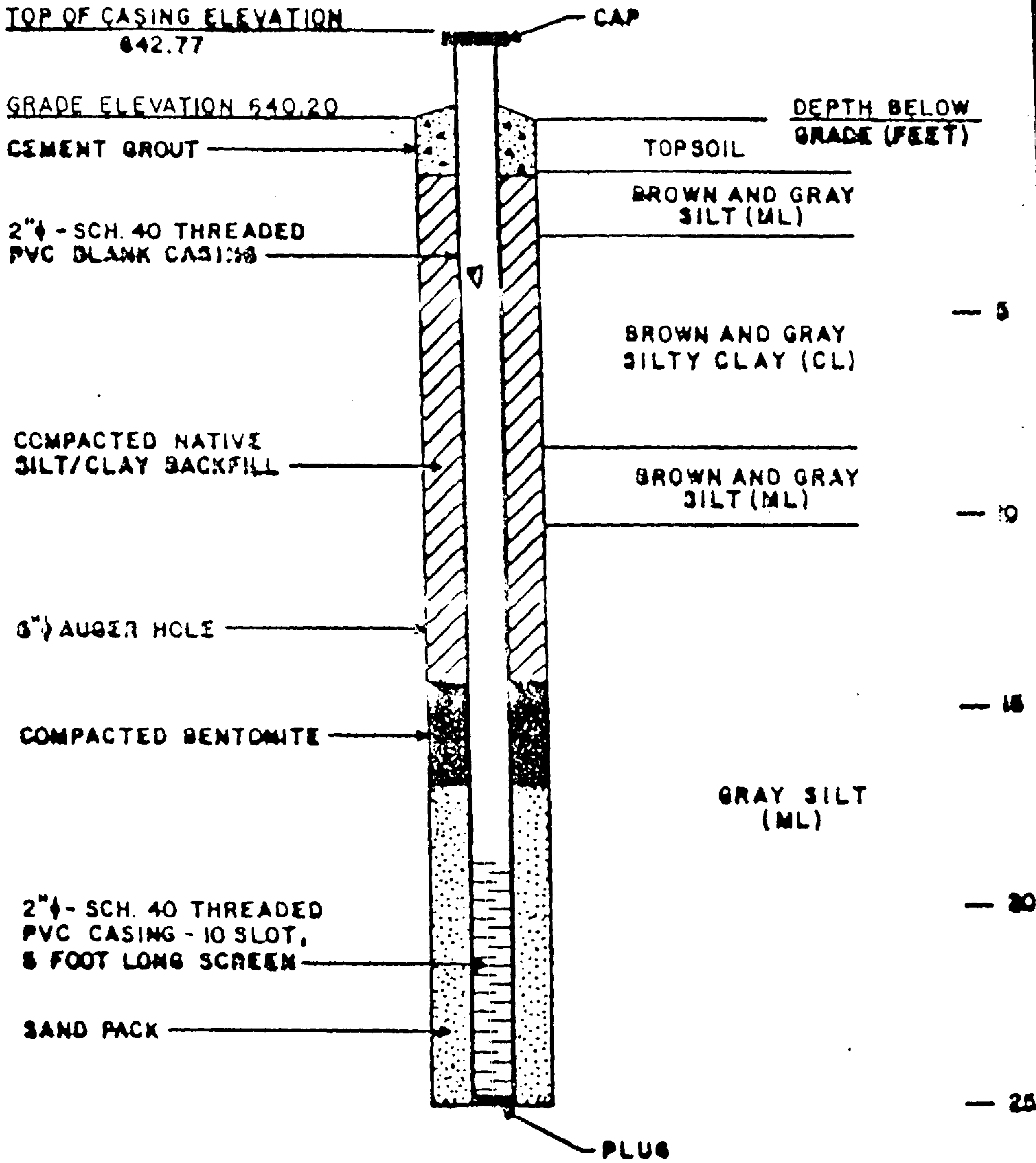
MONITORING WELL CONSTRUCTION
LINDE WELDING

WELL 202

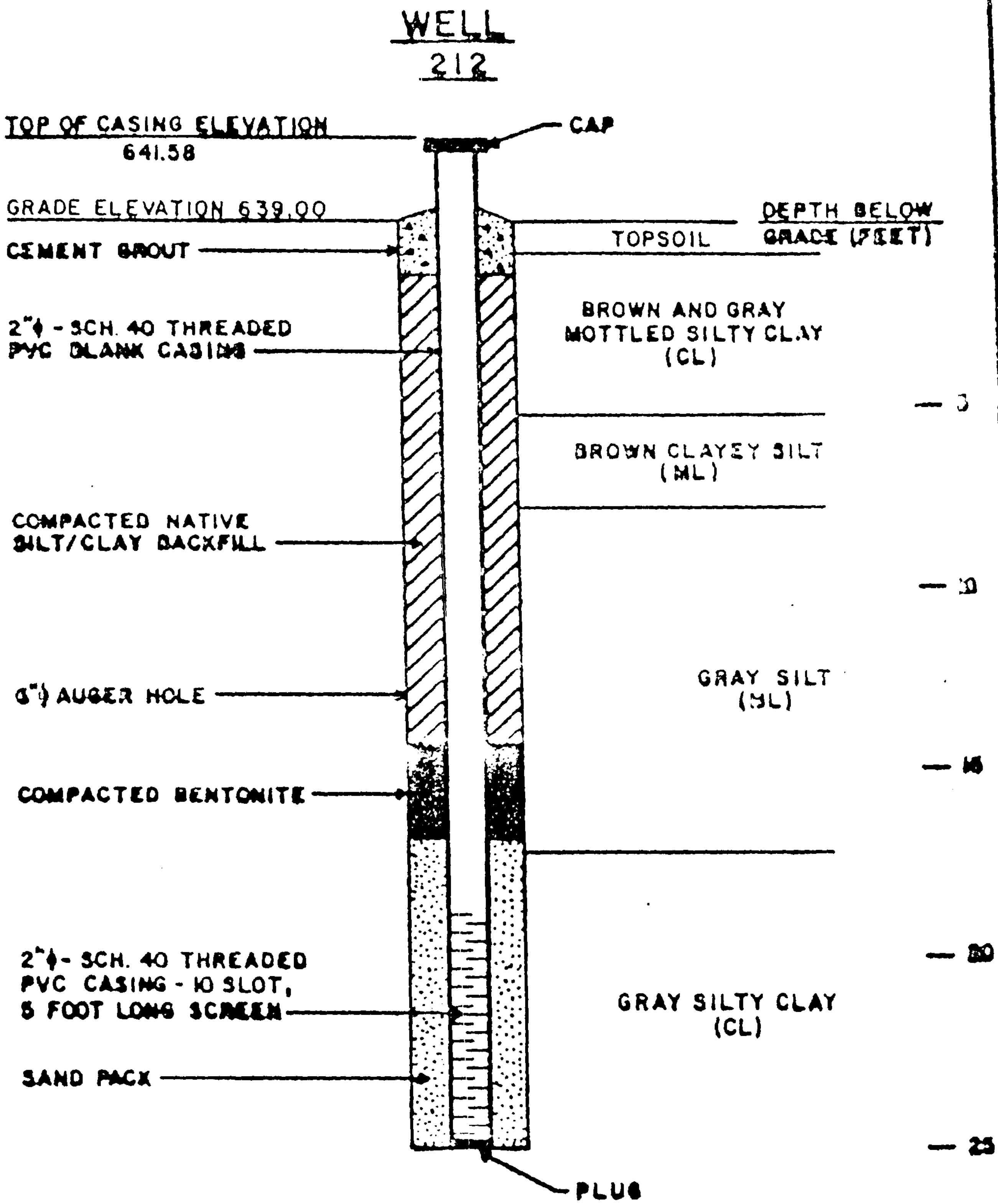


MONITORING WELL CONSTRUCTION
LINDE WELDING

WELL 203

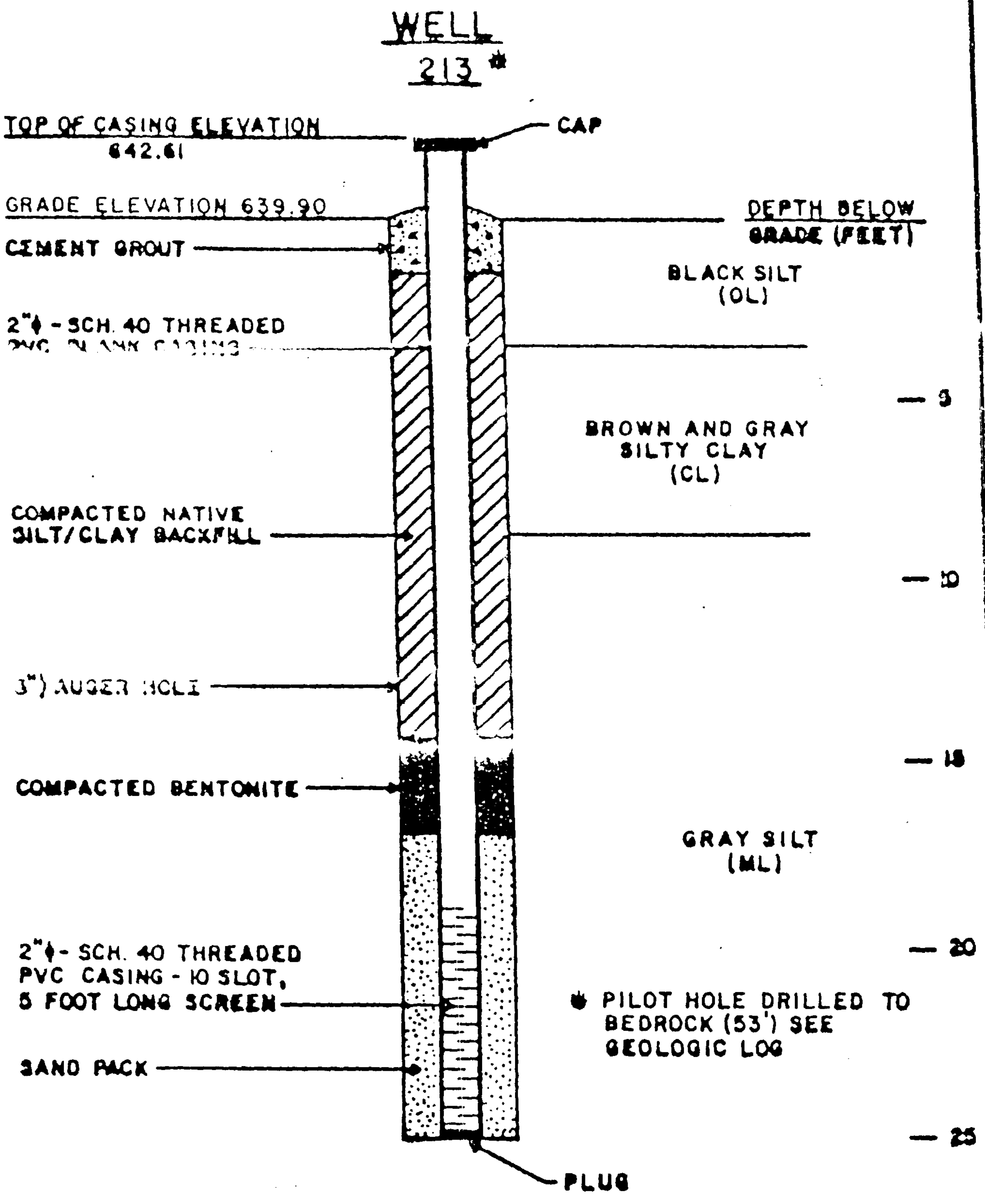


MONITORING WELL CONSTRUCTION LINDE WELDING



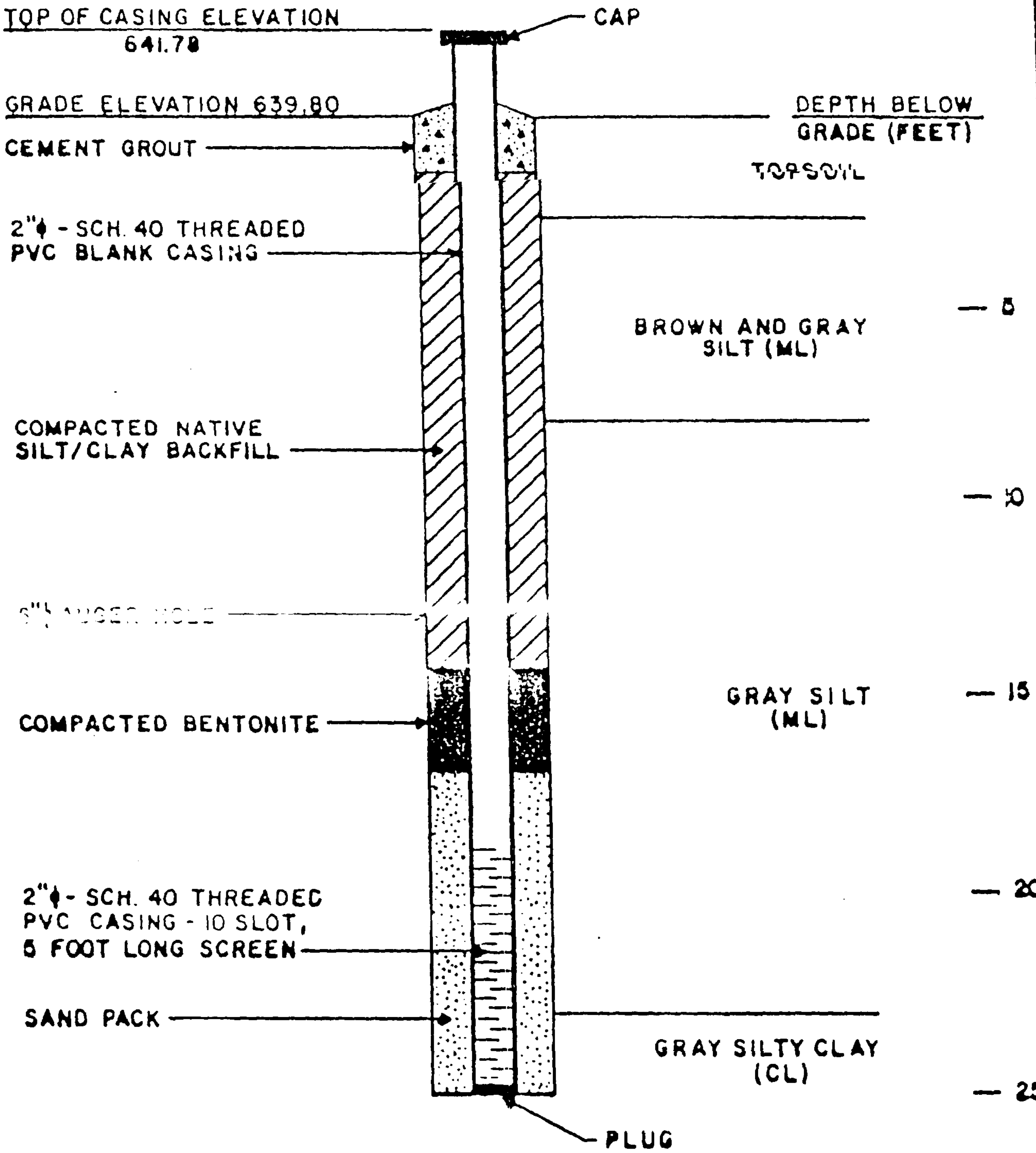
MONITORING WELL CONSTRUCTION LINDE WELDING

ENGINEERING-SCIENCE ES



MONITORING WELL
CONSTRUCTION
LINDE WELDING

WELL
214



MONITORING WELL
CONSTRUCTION
LINDE WELDING

APPENDIX B

STATISTICAL ANALYTICAL PROCEDURES

APPENDIX B

STATISTICAL ANALYTICAL PROCEDURES

The following was directly obtained from the Ohio EPA, Groundwater Monitoring Guidance Document.

The t-Test procedure (Cochran's Approximation to the Behrens-Fisher Student's t-Test) is included in Appendix IV of the proposed regulations identified in the Federal Register, Volume 47, No. 143, 26 July 1982, Subpart F. This procedure is recommended by the U.S. EPA for use in determining whether or not there is a significant difference in groundwater quality (indicating contamination) between the upgradient and the down-gradient wells. Ohio regulations do not at this time contain any such procedure, but it will probably be incorporated next year. It is recommended that facilities follow this procedure to ensure consistency of results and simplify reporting.

One of the key assumptions behind the t-Test is that the data used is normally distributed. The first step in this procedure is to determine whether or not this is true for the data supplied by the groundwater sampling at each facilitiy. The <u>coefficient of variation</u> is used to determine if the data distribution is likely to be normal. This coefficient of variation (CV) is defined as the sample standard deviation divided by the sample mean, or:

$$CV = \frac{s}{x}$$

Where:

$$s = \sqrt{s^2}$$

$$s^2 = \frac{(X_1 - \bar{x})^2 + (X_2 - \bar{x})^2 + \ldots (X_n - \bar{x})^2}{n - 1}$$

$$\bar{x} = \frac{X_1 + X_2 + \ldots X_n}{n}$$

X = value of an observation

n = number of observations in a set of data

Use the initial background data to compute the co-efficient of variation. If the co-efficient of variation is less than 1.00, it is assumed that the sample is likely to have a normal distribution. If the data distribution is not normal, an alternate procedure will have to be used. (For justification of this and the entire t-Test procedure, see the comments in the Federal Register, Vol. 47, No. 143, Monday, July 26, 1982).

If the co-efficient of variation is less than 1.00, calculate the following t-statistic (t*):

$$t^* = \frac{\bar{x}_m - \bar{x}_B}{\sqrt{\frac{s_m^2}{n_m} + \frac{s_B^2}{n_B}}}$$

Where:

$\bar{x}_m$ = mean of sample taken at monitoring point

$\bar{x}_B$ = mean of initial background data

s_m^2 = variance of sample taken at monitoring point

s_B^2 = variance of initial background data

n_m = number of observations in sample taken at monitoring point (no less than 4)

n_B = number of observations in initial background data (no less than 16)

Appendix IV notes that "if the value of this t-statistic is negative, then there is no difference between the monitoring data and the background data".

If the t* value is positive, then calculate the comparison t-statistic (t_c).

This is not the typical next course of action in most t-Test procedures. Normally, one compares the calculated t-value to one found in the t-table at a specified level of significance. However, one of the underlying assumptions of such procedures (besides normality of distribution) is that the variances of the two data sets will be equal. This assumption cannot be made for groundwater samples taken for the RCRA program. The initial background data will have variability due to measurement error and seasonal variability, since this data is accumulated over a year. This initial background is compared with a single sample taken at one point in time, so while there is still the possibility of measurement error, of course there will be no seasonal variability. Since the standard t-table was computed based on the assumption of equal variance, some adjustment is needed to compensate ... the unequal variances of the two data sets being compared. The comparison t-statistic is then a weighted t-value computed from the standard t-table that reduces the chance of not detecting contamination when it is there.

$$t_c = \frac{W_m t_m + W_B t_B}{W_m + W_B}$$

Where:

$$W_m = \frac{s_m^2}{n_m} \quad \text{and} \quad W_B = \frac{s_B^2}{n_B}$$

t_m = value from the standard t-table with (n_m - 1) degrees of freedom, at the .01 level of significance.
t_B = value from the standard t-table with (n_B - 1) degrees of freedom, at the .01 level of significance.

Compare the t* statistic to the t_c statistic.

If t* is equal to or larger than t_c, then conclude that there probably is a significant increase in the parameter being tested.

If t* is less than t_c, then conclude that there probably has not been a significant change in the parameter being tested.

The test for pH is a two-tailed test, since a significant increase or decrease in pH is of concern to the Ohio EPA. The t-value from the table should come from the column headed .005 for the appropriate degrees of freedom. Use the absolute value of t* (ignore the negative sign, if any) when comparing t* to t_c.

Additional samples should be taken from any well where a significant increase or pH decrease has been detected. These samples should be split in two and analyzed to determine whether the significant difference was a result of laboratory error. 3745-55-93(C)(2). If this analysis confirms the significant increase, or pH decrease, then the facility will initiate a groundwater quality assessment program as described in 3745-55-93(D).

There is one big difference between the method outlined above and what is found in the Federal Register. This is the level of significance used. The July 26, 1982 Federal Register specified a .05 level of significance. However, the Interim Status Standards (40 CFR, Part 265) specified a .01 level of significance, so this is what went into Ohio regulations. (Ohio EPA's regulations are required to be substantially equivalent). Ohio will not be promulgating its final land regulations until after the federal regulations come into effect on January 26, 1983. Until this happens, facilities will be required to use .01 as the level of significance.

The Ohio EPA prefers that the above procedure be used by all Ohio facilities required to do groundwater monitoring. However, alternate procedures may be allowed if a facility can demonstrate that this procedure is not appropriate. The alternate procedure should try to balance the risk of indicating contamination when there is none, and the risk of not indicating contamination when it, in fact, exists. Any facility that wishes to use an alternate procedure should submit the procedure and justification for its use by 4 February 1983, or within 2 months after its last quarter of data is collected. The alternative procedure should be sent to the Director, Ohio EPA, in care of:

Mr. Thomas E. Crepeau, Manager
Permits & Manifest Records Section
Division of Hazardous Materials Management
OHIO EPA
P.O. Box 1049
Columbus, Ohio 43216-1049

Unless otherwise indicated, all other groundwater data or supporting materials should be sent to Crepeau. Please send all information <u>clearly marked</u> as to contents.

IMC CHEMICAL GROUP • ELECTROCHEMICALS DIVISION
P.O. Box 858 (Middle Road) • Ashtabula, OH 44004
Telephone: (216) 997-5221 • TWX 810-427-2934

19-5L460/00272

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INTERNATIONAL MINERALS & CHEMICAL CORPORATION

June 21, 1979

Ohio Environmental Protection Agency
Office of Land Pollution Control
2110 East Aurora Road
Twinsburg, Ohio 44087

Attn: Deborah J. Berg, R.S.
Environmental Scientist

Re: Solid Waste Recovery

Dear Ms. Berg:

In response to the solid waste questionnaire, we have completed our survey of the waste materials generated at our facility.

There are four (4) areas within the Chlor-Alkali plant which generate wastes. They are the caustic potash filters, the potassium chloride brine filters, the brine settler purge, the EPA filteration system, and the retort system.

Waste from the caustic potash filters consists of diatomaceous earth and carbon black contaminated with mercury. The area contributes about 650 lbs./month. All the sludge from a filter blowdown is pumped to the on-site lagoon.

The brine filter cake consists of diatomaceous earth contaminated with calcium, magnesium, potassium and mercury. This system contributes approximately 27,000 lbs./month of dry cake which also is emptied into the lagoon.

The EPA system which treats and filters contaminated water from the lagoon contributes approximately 9,000 lbs/month of filter cake. This cake also consists of diatomaceous earth contaminated with mercury and is returned to the lagoon.

The brine settler contributes approximately 120,000 lbs./month which consists of potassium chloride, calcium carbonate, magnesium hydroxide and mercury. The solids from the settler purge are taken to the lagoon.

The retort system handles graphite from the mercury cell decomposers. It also recovers mercury from cell end box cleanings. After the materials are retorted they are taken to the lagoon. The system contributes approximately 2,000 lbs./month of solids.

The total volume of dry materials returned to the on-site lagoon is approximately 157,000 lbs./month or 960 tons/year.

The lagoon is an earthened dike above grade with approximate dimensions of 600' x 140' x 5'. It has a capacity of 420,000 cubic feet.

Prior to 1975, brine sludges were removed from the property by Morton Salt Company of Fairport, Ohio. The ultimate disposal and treatment site is unknown by the writer.

Lake Grandgate
old Morton Salt
dump?

Current disposal of scrap metal is by Acme Scrap, trash and garbage by Ashtabula County Waste Disposal and oil by Laskin Waste Oil Service.

If there are any questions, please feel free to call.

Very truly yours,
International Minerals & Chemical Corporation

George Shahin

George Shahin
Plant Manager

GS/ek

cc: D. Larsen - Mundelein
Dennis D. Ahlstrom
J. Reese

61

REPORT OF FIELD AND LABORATORY TESTS

IMC CHEMICAL GROUP, INC.

MIDDLE ROAD

ASHTABULA, OHIO

F O R

IMC Chemical Group, Inc.

Ashtabula, Ohio

HCI Project No: M-9097.341L

Report Submittal Date: 18 March 1980

HERRON CONSULTANTS, INC.

ENGINEERING • TESTING • INSPECTION

HERRON CONSULTANTS, INC.
ENGINEERING • TESTING • INSPECTION
5405 SCHAAF ROAD CLEVELAND, OHIO 44131

18 March 1980

IMC Chemical Group, Inc.
Electrochemical Division
P. O. Box 858
Middle Road
Ashtabula, Ohio 44004

Attention: Mr. Earl Sparks

SUBJECT: REPORT OF FIELD & LABORATORY TESTS
IMC CHEMICAL GROUP, INC.
MIDDLE ROAD
ASHTABULA, OHIO 44004

HCI Project No: M-9097.341L

During the period between January 21, 1980 and February 13, 1980 test boring and sampling operations were conducted and groundwater observation wells and piezometers were installed at the subject site.

The locations of the wells were as selected by Mr. Sparks and were drilled under the direction of Mr. Michael Zwart of P.E. LaMoreaux and Associates.

Under the direction of Mr. Zwart three deep wells, three shallow wells and six piezometers were drilled and installed.

DRILLING AND SAMPLING OPERATIONS

Test holes were drilled by conventional rotary drilling techniques using a CME Model 750 all-terrain vehicle employing hollow stem flight augers (3¼" i.d.) for boring hole advancement.

Soil samples were obtained in all borings utilizing a 2" o.d. split spoon sampler driven by a 140 lb. hammer, free falling 30". Samples were taken continuously to the terminal depth of the boring. All drive samples obtained during the drilling operation were retained by Mr. Zwart.

In addition to drive samples, thin walled Shelby tube samples were taken for laboratory permeability tests. These samples were obtained by pushing a Shelby tube sampler into the soil by steady static force and extracting it retaining the soil sample. The ends of the sampler were sealed with wax to prevent moisture loss and were returned to the laboratory for testing.

OBSERVATION WELLS AND PIEZOMETERS

Well Screens for observation wells were installed in the bore holes as directed using 4" diameter - 60 slotted stainless steel well screens, 10' long in deep wells and 4' long in the shallow wells. Standard black iron pipe was extended from the well screen to approximately 1' above the surface.

Gravel filter was then placed around the screen until it was approximately 1' above the top of the screen. Subsequently, the bore hole was sealed with cement grout to the ground surface. All abandoned holes were also filled with grout.

Plastic wellpoint piezometers (2" i.d.) were also installed in the same manner as the observation wells.

Included in the Appendix of this report under Plate 1 is a schematic drawing of a typical observation well.

FIELD PERMEABILITY TESTS

In test borings OW9, OW10 & OW11 field permeability tests were carried out. All tests were open-casing tests and were conducted under gravity head only. The in-place permeability of subsoils was determined in proximity to the terminal depths of test borings. The hollow stem flight augers (3¼"i.d.)

were saturated under pressure. Following saturation water was forced through the saturated sample and the amount of discharge as a function of time was measured. The initial condition of the samples and the permeability test results are summarized in Table No. II in the Appendix. The duration of tests ranged between 35 minutes and 8 hours, depending upon the permeability characteristics of the soil involved. For soils of relatively high permeability two successive tests were conducted for each sample and the average permeabilities were recorded in the Table. For the silty clay with silt layers soil obtained from Boring OW9 at 10.5' the duration of test was 8 hours. During this period only 0.5 cubic centimeter water passed through the sample.

Samples obtained from Borings OW9 at 23.4' and in Boring OW11 at 25.4' were found to be of high clay contents and are considered for practical purposes impervious. No permeability tests were conducted on these samples since reliable results could have been obtained from consolidation test data; however, to conduct a one point consolidation test to determine the coefficient of permeability 3" diameter undisturbed samples are required. Only 2" diameter undisturbed samples were obtained in the test borings.

The coefficients of permeabilities based on laboratory constant head tests were computed from the following formula.

$$k = QL/hAt$$

where: Q = discharge

L = length of sample

h = hydraulic head

A = sample cross-sectional area

t = duration of test

A P P E N D I X

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T A B L E I

FIELD PERMEABILITY TEST RESULTS

Boring Number	Test Depth (ft.)	Test No.	Coefficient of Permeability - cm/sec. Maximum	Average	Minimum
OW9	35.0	1	7.3×10^{-4}	1.9×10^{-4}	Impervious*
		2	1.8×10^{-4}	6.1×10^{-5}	Impervious*
		3	9.3×10^{-5}	3.1×10^{-5}	Impervious*
OW10	8.0	1	5.2×10^{-4}	1.6×10^{-4}	3.7×10^{-5}
		2	5.1×10^{-4}	1.6×10^{-4}	3.9×10^{-5}
	27.5	1	2.8×10^{-4}	7.8×10^{-5}	5.7×10^{-6}
		2	2.8×10^{-4}	7.7×10^{-5}	4.7×10^{-6}
OW11	43.0	1	2.4×10^{-5}	1.8×10^{-5}	1.5×10^{-5}
		2	3.2×10^{-5}	1.7×10^{-5}	1.0×10^{-5}

NOTE: (*) No dissipation of water was observed for at least 15 minute time interval

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TABLE II

SUMMARY OF LABORATORY PERMEABILITY TEST RESULTS

Boring Number	Sample Depth (ft.)	Initial Moisture Content (%)	Initial Dry Density (PCF)	Applied Head (PSI)	Coefficient of* Permeability cm/sec.	Material Classification
OW9	1.5	20.4	96.4	7.75	4.9×10^{-4}	Brown silt-clay, sandy some vegetation. Fill (ML-CL)
	10.5	27.8	109.2	20.0	5.4×10^{-8}	Layers of gray silty c and silt. (CL) (ML)
	23.4	-	-	-	**	Gray silty clay. Some sand and gravel. (CL)
OW10	4.5	23.2	111.4	10.0	9.2×10^{-5}	Gray silt. Trace Clay (ML)
OW11	4.5	23.6	98.6	7.0	1.2×10^{-3}	Brown silt. Some sand Trace Clay. (ML)
	9.5	19.5	113.4	9.0	1.2×10^{-5}	Gray silt. Some Clay. (ML)
	25.4	-	-	-	**	Gray silty clay. Some sand & gravel. (CL)

(*) Coefficients of permeability based on constant head tests. 2" diameter Shelby tube samp

(**) Practically impervious material. Constant head test unsuitable for coefficient of permeability coefficient determination from consolidation test data.

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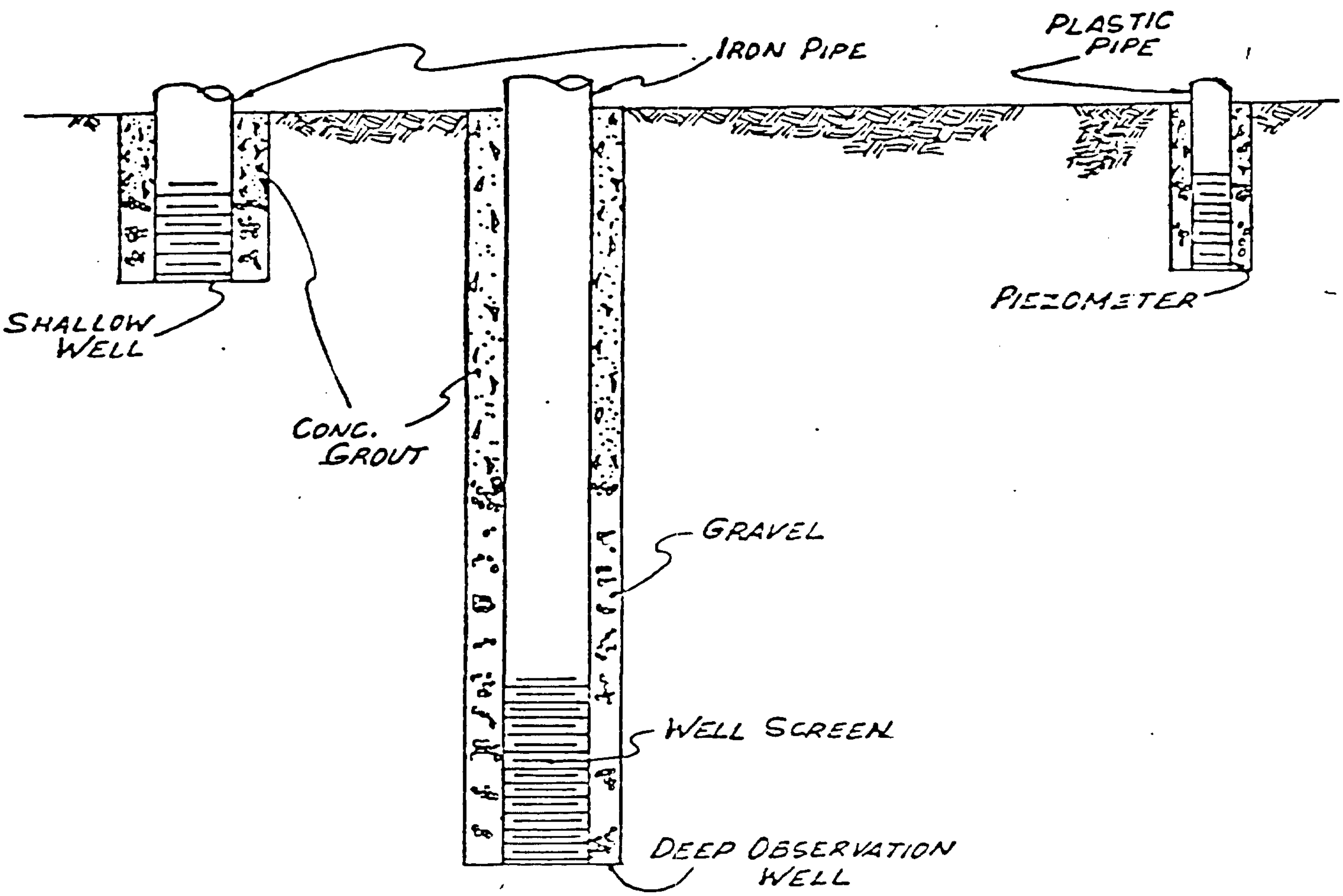
PLATE 1

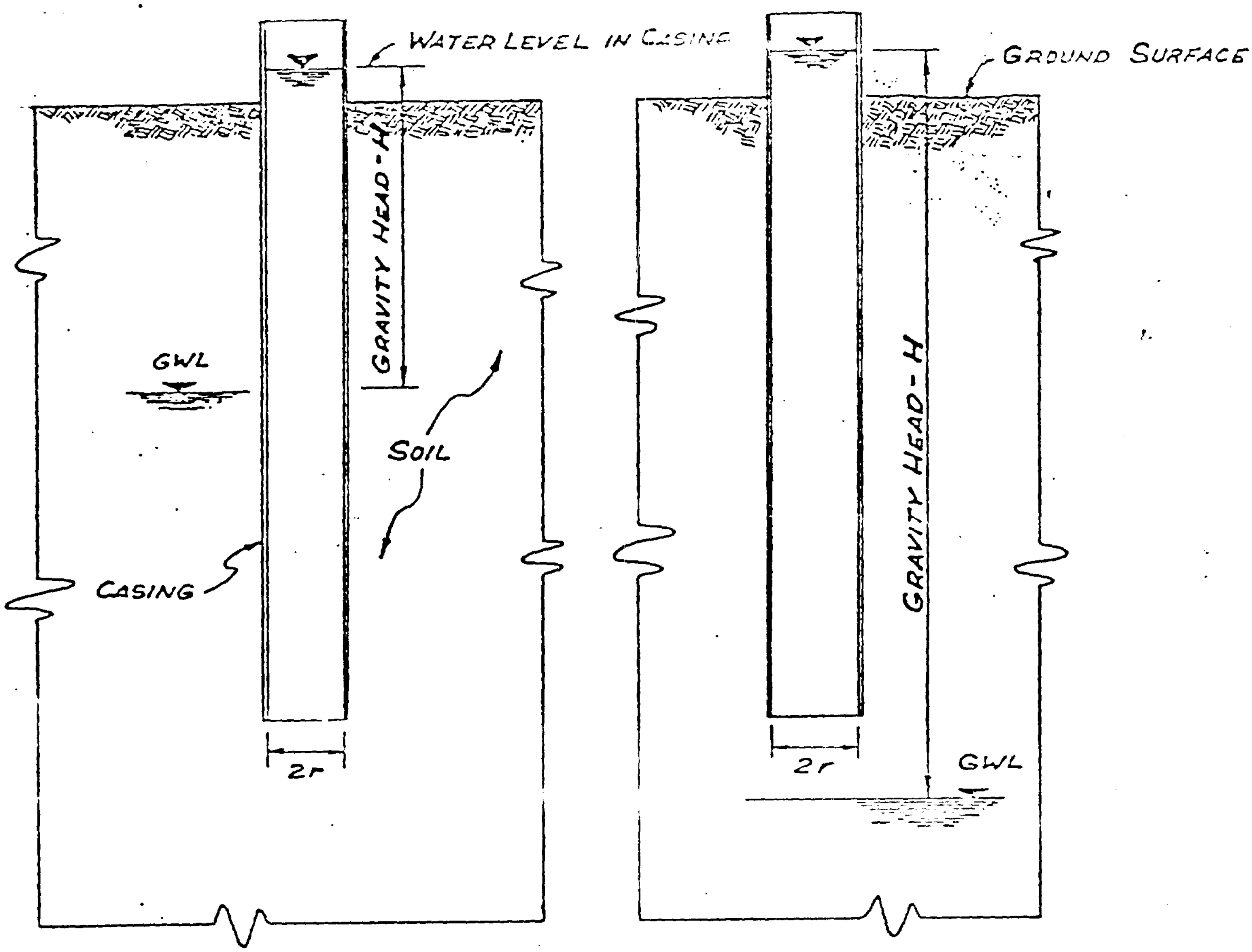


TYPICAL MONITORING WELLS

SCHEMATIC DRAWING - NO SCALE
DATE: 3-18-80

M-9097

HERRON CONSULTANTS INC.



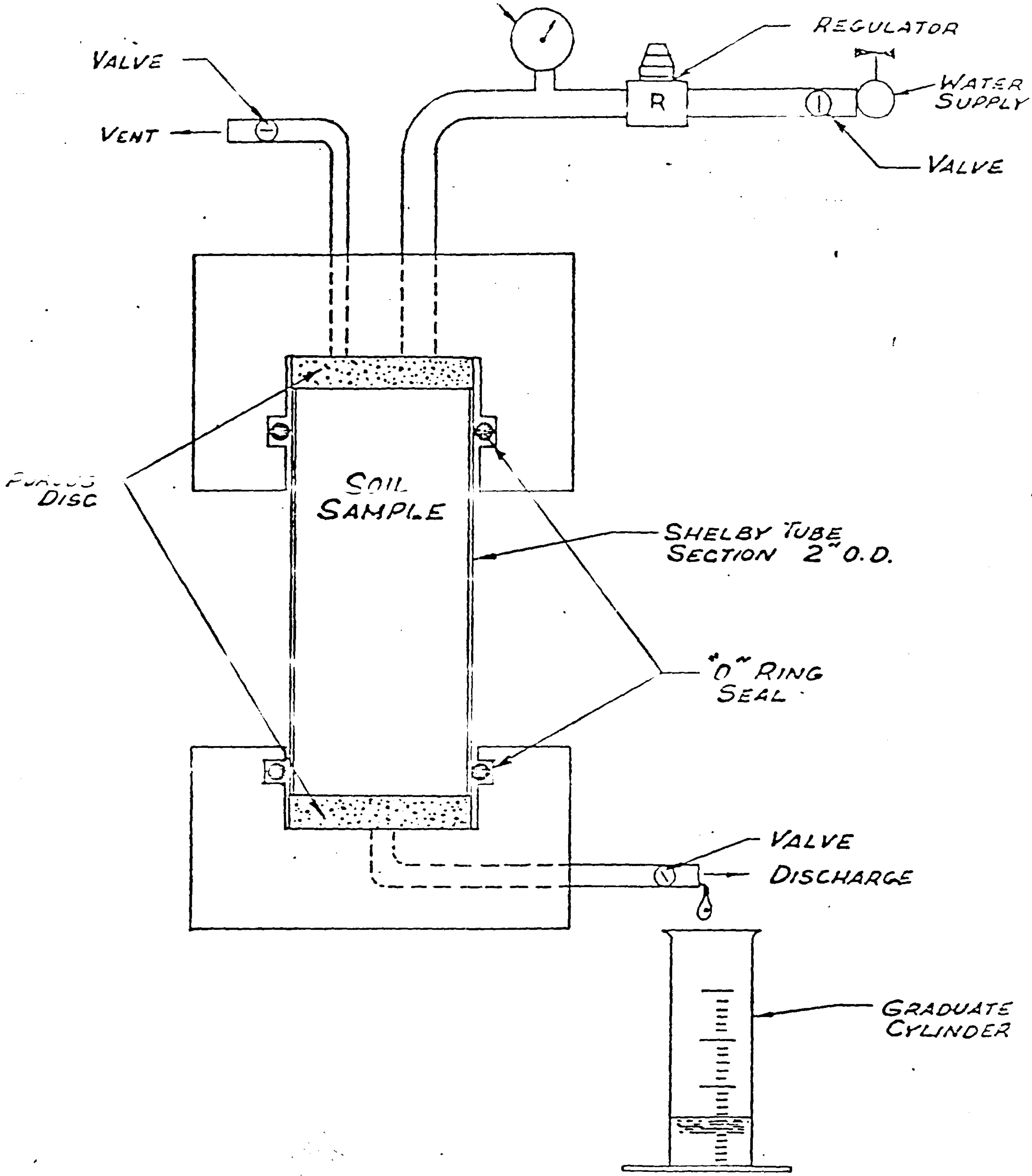
FIELD PERMEABILITY TEST IN BORE HOLE

SCHEMATIC DRAWING OF OPEN-END CASING TEST

DATE: 3-13-80 - NOT TO SCALE

M-9097 HERRON CONSULTANTS INC

SD-574 DWN - [illegible]



LABORATORY CONSTANT HEAD PERMEAMETER

SCHEMATIC DRAWING – NO SCALE
DATE: 3-13-80

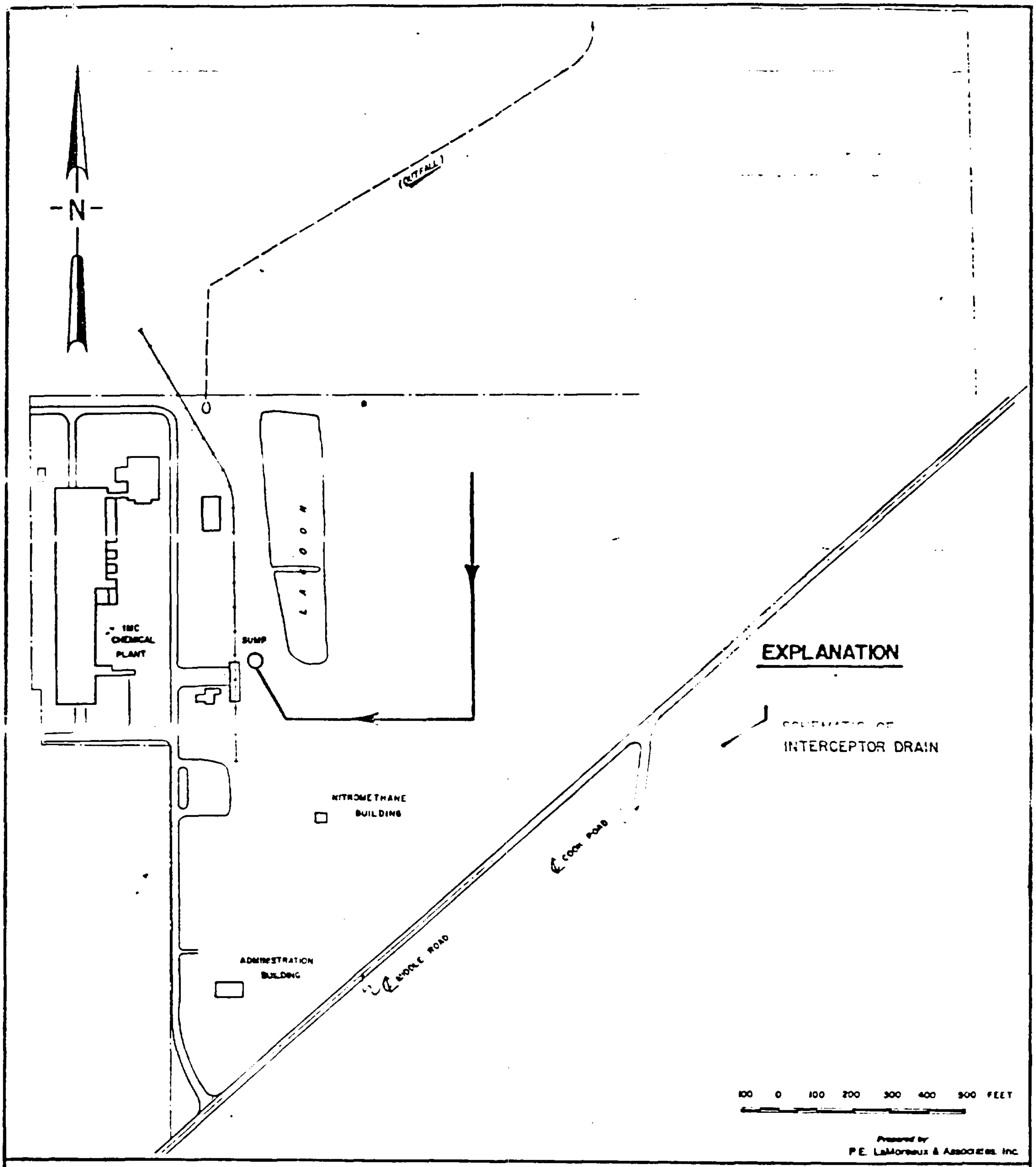


PLATE 12. PHASE II, DRAINAGE DIAGRAM.

IMC CHEMICAL GROUP

ASHTABULA OHIO

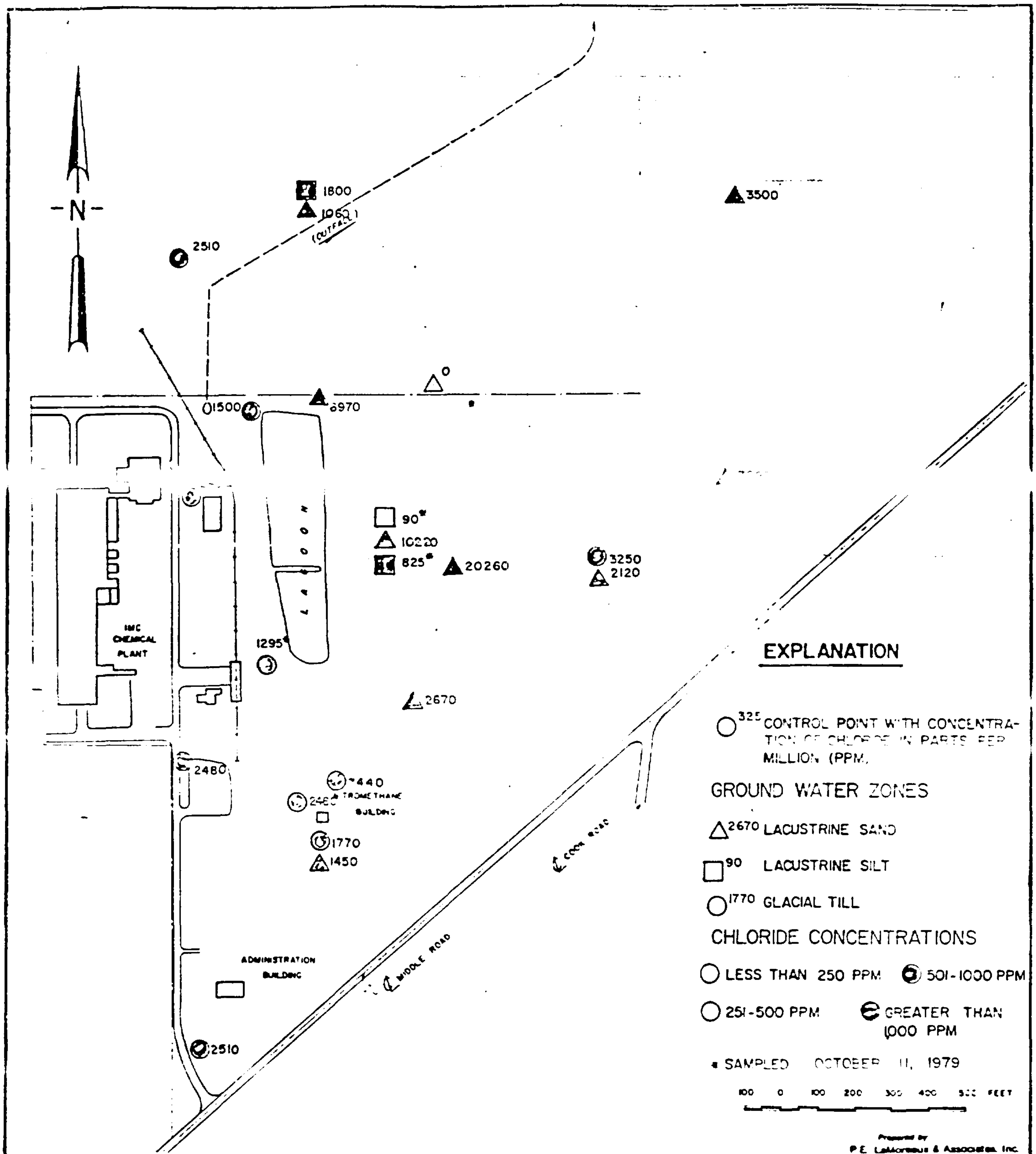


PLATE 11. CONCENTRATION OF CHLORIDE IN GROUND-WATER, FEBRUARY 14, 1980.

IMC CHEMICAL GROUP

ASHTABULA OHIO

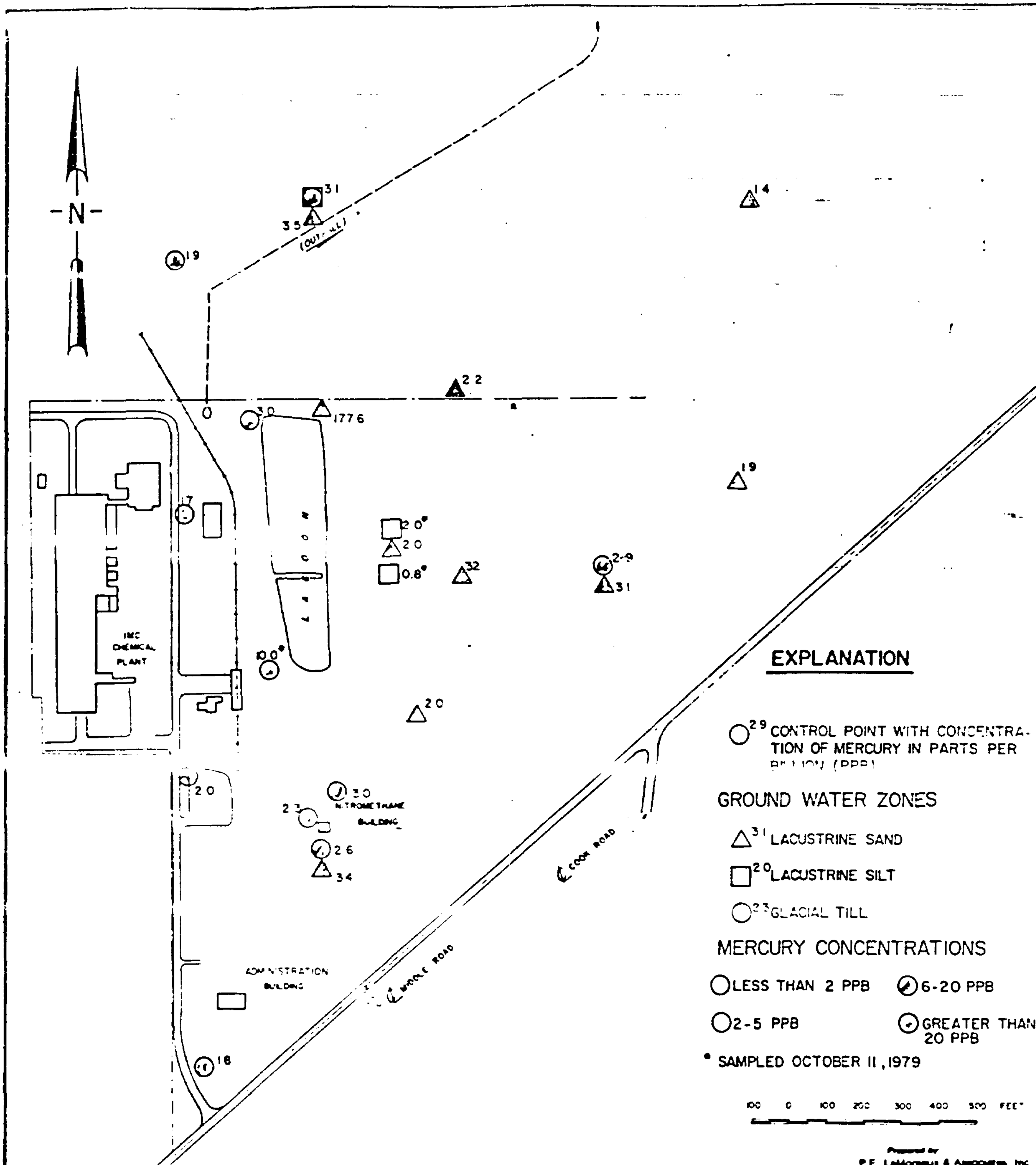


PLATE 10. CONCENTRATION OF MERCURY IN GROUND-WATER, FEBRUARY 14, 1980.

IMC CHEMICAL GROUP

ASHTABULA OHIO

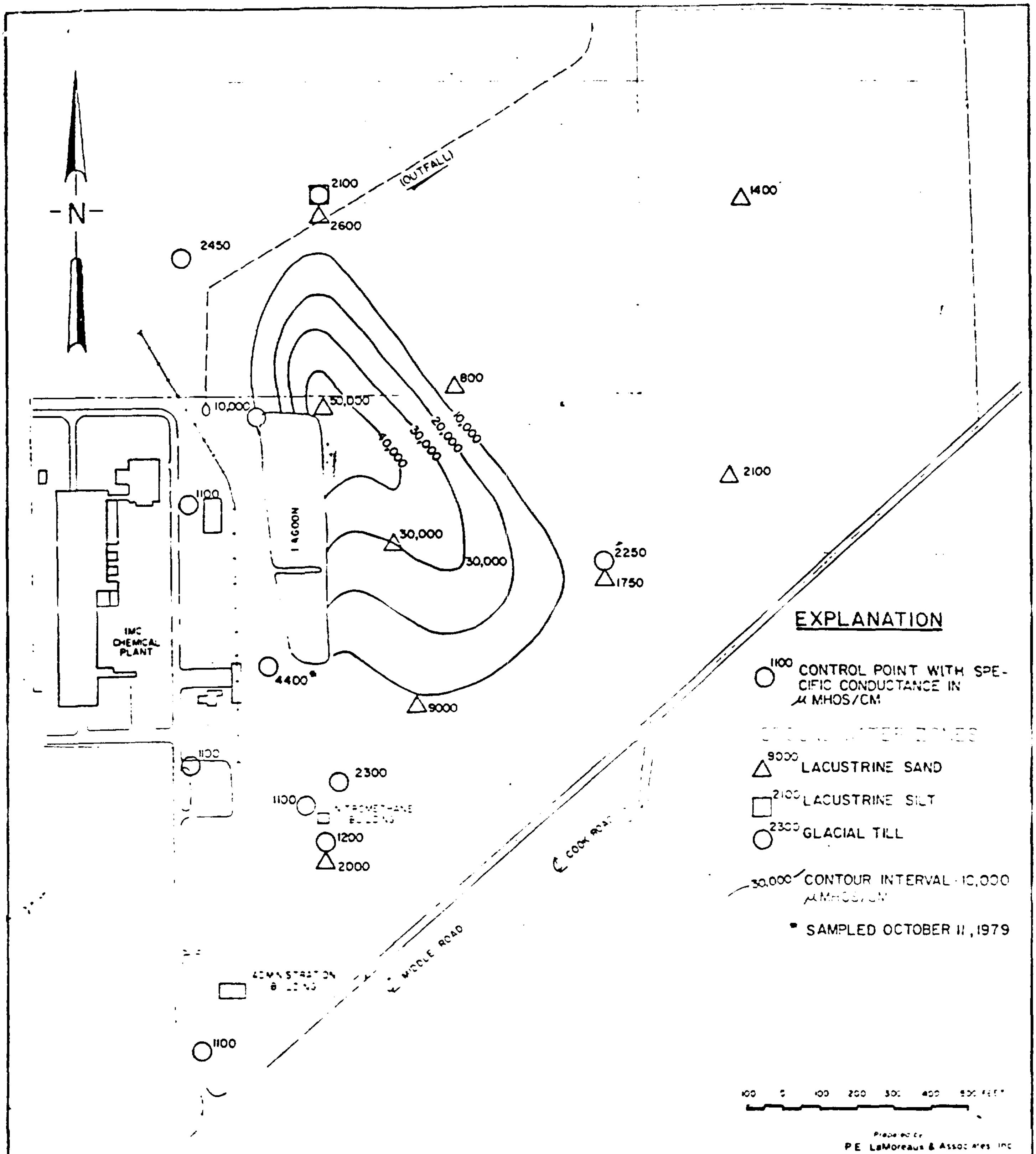


PLATE 9. GROUND-WATER SPECIFIC CONDUCTANCE, FEBRUARY 14, 1980.

IMC CHEMICAL GROUP

ASHTABULA OHIO

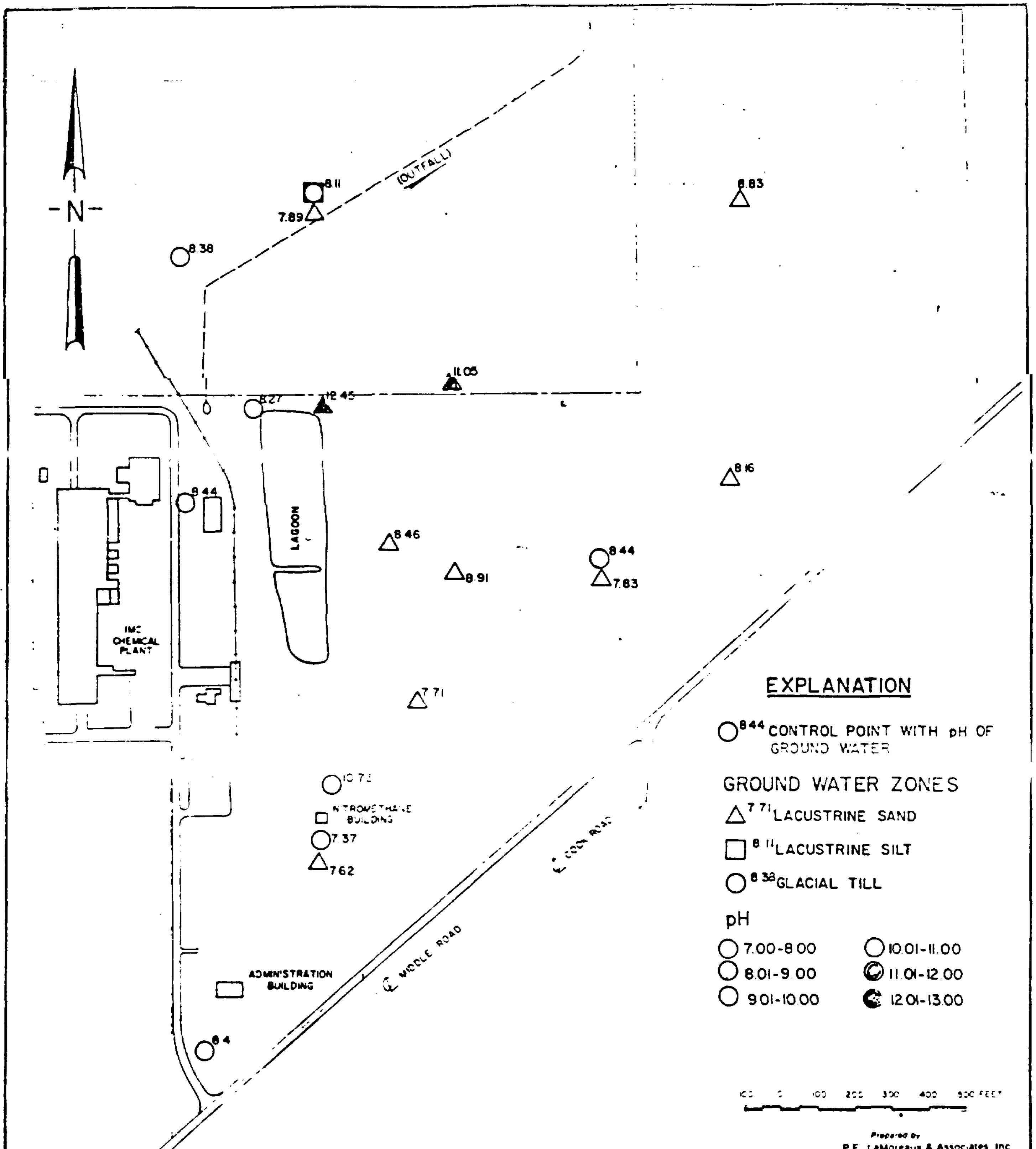


PLATE 8. GROUND-WATER pH, FEBRUARY 14, 1980.

IMC CHEMICAL GROUP

ASHTABULA OHIO

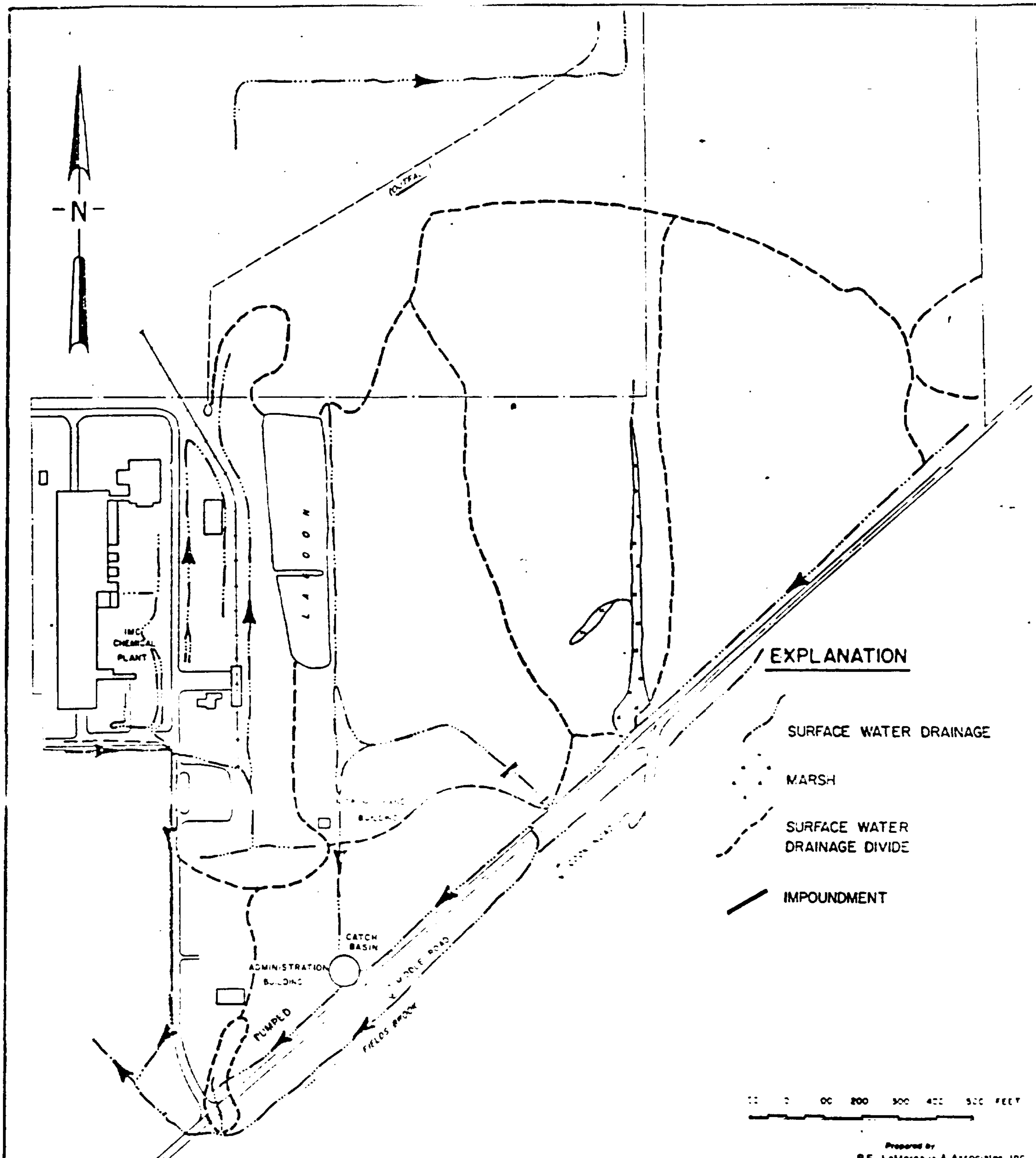
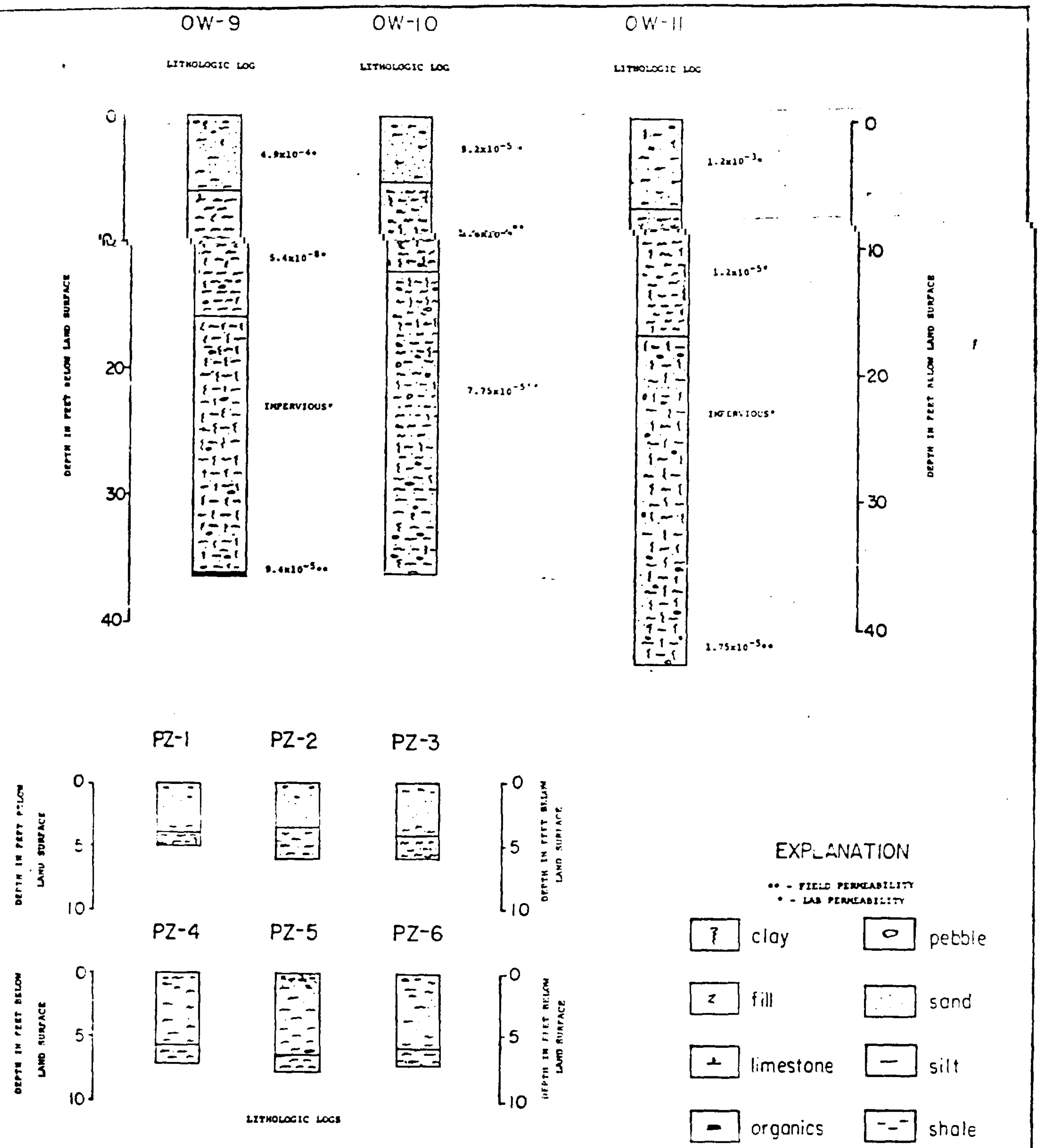


PLATE 7. SURFACE-WATER DRAINAGE MAP.

IMC CHEMICAL GROUP

ASHTABULA OHIO



Prepared by
P.E. LaMoreaux & Associates, Inc.

PLATE 6. LITHOLOGIC LOGS AND PERMEABILITY DATA

IMC CHEMICAL GROUP

ASHTABULA OHIO

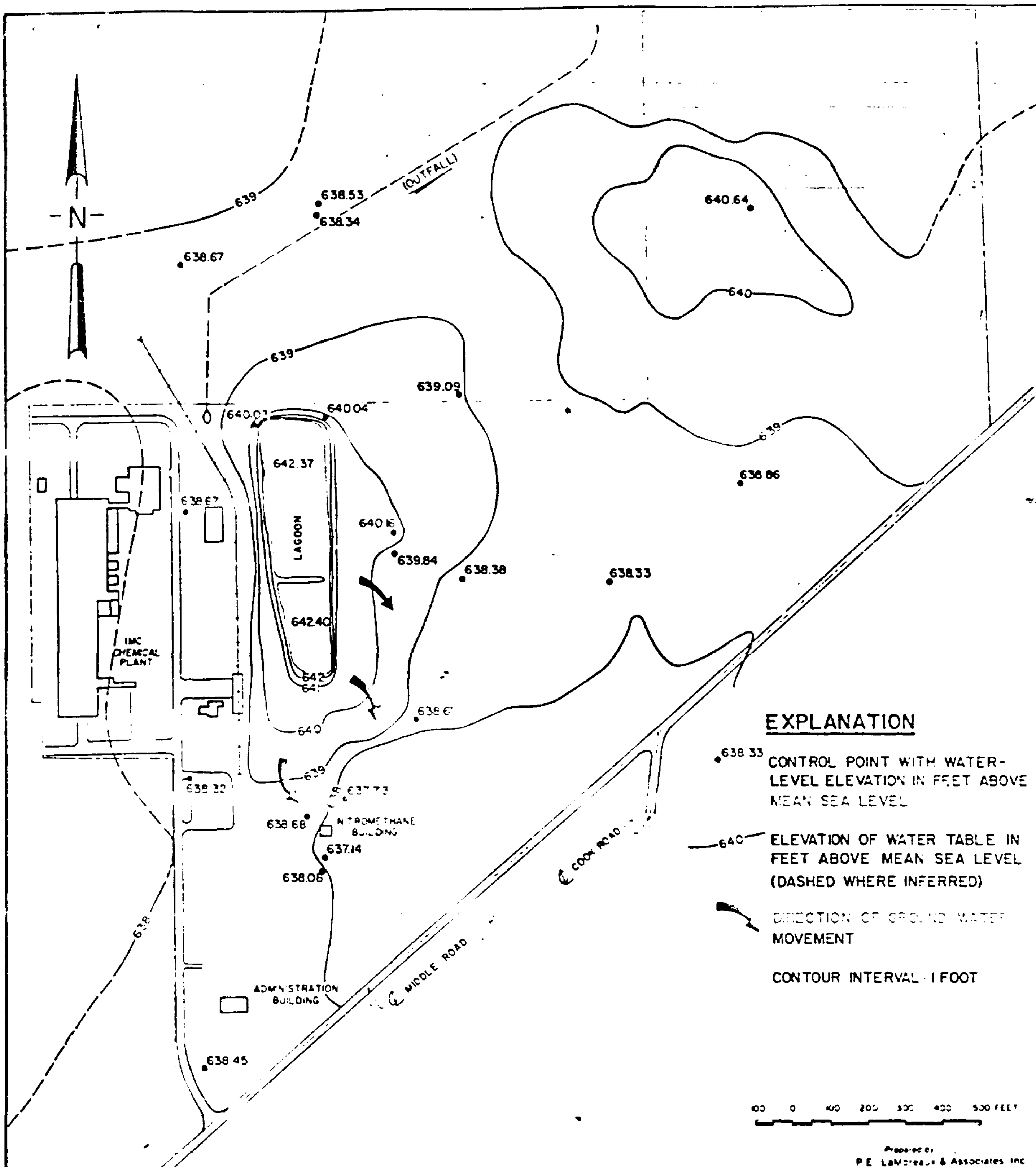


PLATE 5. WATER TABLE, MARCH 10, 1980.

IMC CHEMICAL GROUP

ASHTABULA OHIO

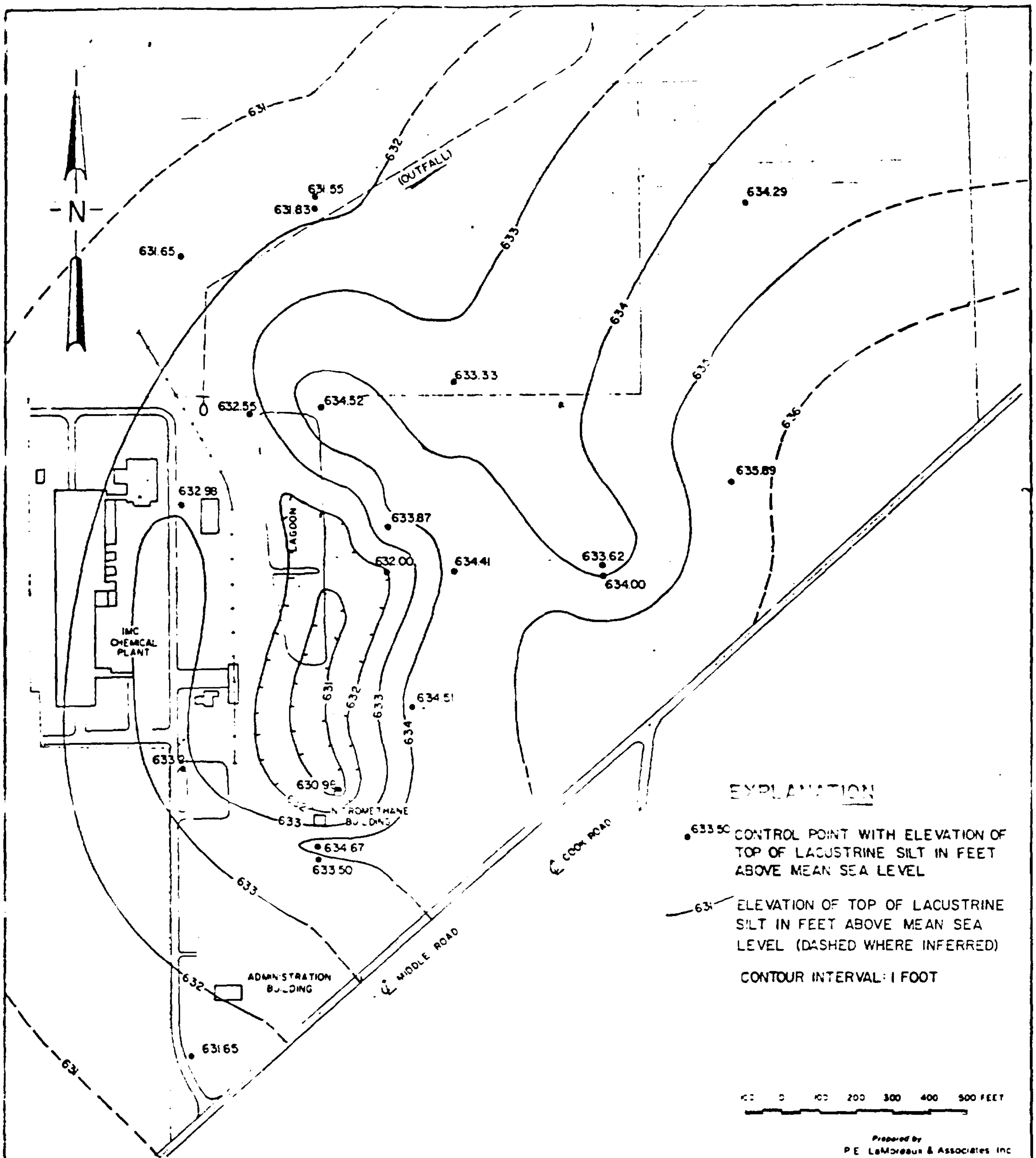
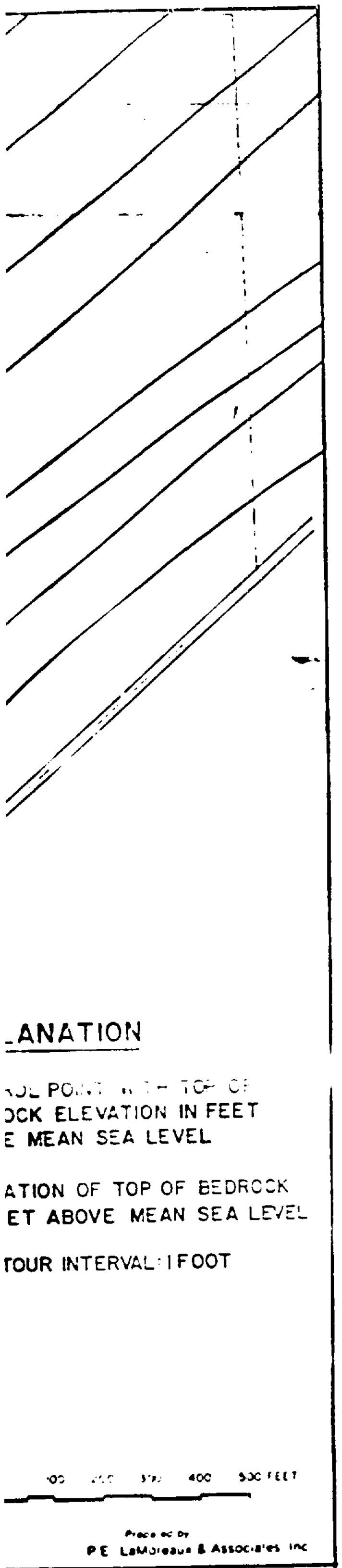


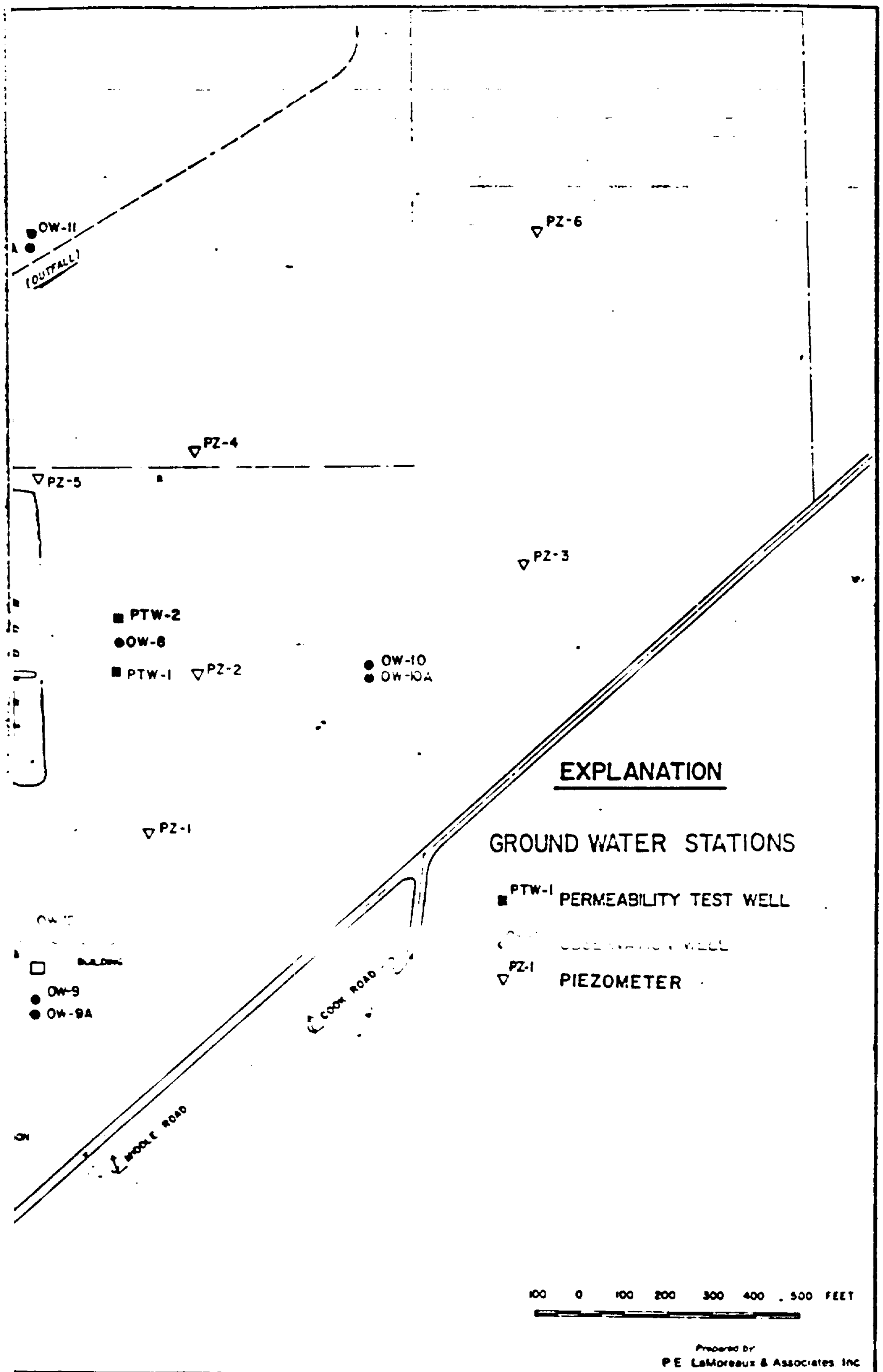
PLATE 4. TOP OF LACUSTRINE SILT.

IMC CHEMICAL GROUP

ASHTABULA OHIO



OHIO



UND-WATER STATIONS.

IMC CHEMICAL GROUP

OHIO

Location/Date	Trichloroethylene(ug/l)	Perchloroethylene(ug/l)
M-4 3/18/81	3.8	<1.0
M-3 3/27/81	540	240
M-2 3/27/81	490,000	340,000
M-1 3/18/81	35,000	31,000
P-1 3/18/81	450	300
P-2 3/18/81	39,000	31,000

1500 / 13400 ug/l

* Testing performed by Envirolab, Inc., Painesville, Ohio.

LSH:hm

5-7-81

Potential Hazardous Waste Site
Preliminary Assessment

Olin Corporation
Middle Road
Ashtabula, Ohio
OHD 001 813 708

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The Olin Corporation is located on Middle Road in the City of Ashtabula, Ashtabula County, Ohio. Olin is located in an industrial area that is one of the largest and most diversified concentrations of chemical plants in Ohio. Olin is bordered on the west by General Tire & Rubber Company. Olin operated a toluene diisocyanate (TDI) plant from 1963 until it's closure in 1982.

The manufacture of TDI involves the reaction between toluene diamine, phosgene, and chlorobenzene. In the years of TDI production, Olin's processes utilized a 14,000 square foot TDI ground storage area, three hazardous waste drum storage areas, and an emergency spill basin. Olin discharged process wastewater, sanitary, and storm water surface runoff through two NPDES outfalls, 001 and 002. Chemical and physical waste degradation processes implemented included carbon absorption, a neutralization tank, and three settling ponds. Olin was involved in a NPDES self-monitoring program through which they reported exceedences of NPDES limits. Excess discharges were chlorobenzene, several other organics, COD, TDS, chlorine and pH. Implementation of new control measures diminished the number of discharge incidents. Olin disposal of other generated wastes off-site.

Olin's closure involved removal of all site buildings and site decontamination, which included removing stored substances, contaminated soil removal and disposal of Fields Brook sediment. The primary toxic chemicals that soils were tested for were monochlorobenzene (MCB) and Toluene Diamine (TDA) The allowable soil levels of MCB and TDS deterimined by Olin, were 100 ppm and 10 ppm, respectively. The concentrations in all contaminated soils encountered on the site ranged from non-detectable to 2,870 ppm of MCB and non-detectable to 37 ppm of TDA. Soil was removed until contamination levels were reduced to within the range of 30 ppm to 33 ppm MCB, and non-detectable to 2 ppm of TDA. Five thousand, one hundred and thirty seven (5,137) cubic yards of on-site soil was excavated and disposed off-site. Clean backfile soils were predominantly clay.

Monochlrobenzene (MCB) accumulation in the sediment was the primary concern of the Olin Field Brook dredging project. Approximately 500 cubic yards of sediment was dredged and removed. Prior to dredging, the Ames test was conducted on an Olin outfall discharge sample. The test proved positive, which indicates the presence of mutagenic/carcinogenic compounds in the sample. Static bioassay tests conducted were inconclusive. The storm sewers were vacuumed twice for the closure.

Due to closure of the Olin plant, and the Fields Brook NPL project, it is recommended the site be given a low priority for FIT activities, and continue a high priority for State/CERCLA activities.

Z-1

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OH	D001813708

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site): OLIN CORPORATION	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER: MIDDLE ROAD / P.O. Box 206
03 CITY: ASHTABULA	04 STATE: OH; 05 ZIP CODE: 44004; 06 COUNTY: ASHTABULA; 07 COUNTY CODE: 07; 08 CONG DIST: 11
09 COORDINATES LATITUDE: 41°53'39.0" LONGITUDE: 080°45'52.0"	ASHTABULA NORTH QUADRANGLE

10 DIRECTIONS TO SITE (Starting from nearest public road)
From Hwy. 11 proceed North on State Road to Middle Road. Proceed east on Middle Road for 0.5 mile. Site is on left.

III. RESPONSIBLE PARTIES

01 OWNER (if known): GENERAL TIRE & RUBBER CO.	02 STREET (Business, mailing, residential): 1 GENERAL ST.
03 CITY: AKRON	04 STATE: OH; 05 ZIP CODE: 44329; 06 TELEPHONE NUMBER: (216) 798-3000
07 OPERATOR (If known and different from owner): OLIN CORPORATION	08 STREET (Business, mailing, residential): 120 LONGRIDGE RD.
09 CITY: STAMFORD	10 STATE: CT; 11 ZIP CODE: 06904; 12 TELEPHONE NUMBER: (203) 356-2000

13 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL: ____ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: ____ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☐ A. RCRA 3001 DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES DATE __/__/__ (MONTH DAY YEAR) 1979 - 1982
☐ NO

BY (Check all that apply)
☒ A. EPA ☐ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: ____ (Specify)
CONTRACTOR NAME(S): ____

02 SITE STATUS (Check one)
☐ A. ACTIVE ☒ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION
1963 (BEGINNING YEAR) | 1982 (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
SLUDGE (TOXIC)
OILY WASTE (TOXIC, IGNITABLE)
SOLVENTS (TOXIC, IGNITABLE, VOLATILE)
OTHER ORGANIC CHEMICALS (TOXIC, IGNITABLE, VOLATILE)
INORGANIC CHEMICALS (TOXIC, PERSISTENT
ACIDS (TOXIC, CORROSIVE)
HEAVY METALS (TOXIC, PERSISTENT)

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
SURFACE WATER (POPULATION/ENVIRONMENT)
GROUNDWATER (POPULATION)
AIR (POPULATION/ENVIRONMENT)
DIRECT CONTACT (POPULATION/ENVIRONMENT)

V. PRIORITY ASSESSMENT FIT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☒ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)		03 TELEPHONE NUMBER
GARY GIFFORD	OHIO EPA (NEDO) TWINSBURG, OH		(216) 425-9171
04 PERSON RESPONSIBLE FOR ASSESSMENT	**05 AGENCY**	**06 ORGANIZATION**	**07 TELEPHONE NUMBER** / **08 DATE**
MARY JANE RIPP	U.S. EPA	ECOLOGY + ENVIRONMENT REGION V	(312) 663-9415 / 7/24/85 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
OH	D001813708

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☒ C. SLUDGE
- ☐ D. OTHER ______ (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS ______
CUBIC YARDS unknown
NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC
- ☒ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☒ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☒ H. IGNITABLE
- ☒ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☒ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE	unknown		located in east, west, middle ponds
OLW	OILY WASTE	unknown		
SOL	SOLVENTS	unknown		
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	unknown		
IOC	INORGANIC CHEMICALS	unknown		
ACD	ACIDS	unknown		
BAS	BASES			
MES	HEAVY METALS	unknown		

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
see above	see attached lists				

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	toluene diamine		FDS		
FDS	chlorine		FDS		
FDS	coke		FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

see attached sources of information.

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
OH	D001813708

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ■ A. GROUNDWATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 152 — 04 NARRATIVE DESCRIPTION
No observed release to groundwater. Olin had air monitoring wells (no information available). Site geology consists of 0'-60' of glacial till (poorly drained sandy clays), below is 1360' of Devonian shale. Residential wells are developed in shale and yield 1-3 GPM. Local residents and industries use Lake Erie water. Potential for contaminants to seep into till, but is highly unlikely wastes will migrate to and thru highly impermeable shale.

01 ■ B. SURFACE WATER CONTAMINATION — 02 ■ OBSERVED (DATE: various) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 0 — 04 NARRATIVE DESCRIPTION
Olin has NPDES permit for outfalls. Local residents and industries use Lake Erie water. Surface water intake is beyond 3-mile radius; therefore, population affected is zero. Olin had outfalls into Fields Brook. On various occasions, Olin exceeded NPDES limitations, usually COD, TDS, Cl, and pH. Fields Brook' sediment near outfall indicated monochlorobenzene contamination. Outfall areas have been dredged and sediment removed during site closure.

01 ■ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 36,000 — 04 NARRATIVE DESCRIPTION
Possible air emissions from buildings during production could have caused a problem. Waste pile not covered; therefore, possible airborne dispersal of contaminants.

Oxygen and phosgene monitors are installed inside and outside plant buildings.

01 ■ D. FIRE/EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 12,112 — 04 NARRATIVE DESCRIPTION
No documented problems. Only potential problem would be the usual chemical manufacturing process hazards.

01 ■ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 3028 — 04 NARRATIVE DESCRIPTION
pre-closure → fence surround facility and 24-hour security (guardhouse)
post-closure → unknown if fenced, but all site buildings removed and contaminated soil + sediment removed.

01 ■ F. CONTAMINATION OF SOIL — 02 ■ OBSERVED (DATE: 1982) ☐ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: ~ one (Acres) — 04 NARRATIVE DESCRIPTION
Various areas on site contaminated with monochlorobenzene and toluene diamine. During closure, all contaminated soil and sediment removed until an acceptable level of contaminants was removed according to USEPA. Backfill soils were predominantly clay.

01 ■ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 152 — 04 NARRATIVE DESCRIPTION
see Sections A + B above.

01 ■ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: ~ 70 — 04 NARRATIVE DESCRIPTION
Unknown if workers wore protective clothing or used protective safety equipment. Workers could have been exposed to air emissions of plant processes.

01 ■ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: ________) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 36,000 — 04 NARRATIVE DESCRIPTION
If contaminants travel to Ashtabula River, population could come into contact as Ashtabula River is used as recreational waterway. O. Dept of Health / OEPA fish ban on in Ashtabula River.

EPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: OH | 02 SITE NUMBER: D001813708

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ■ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Damage to flora may have occurred at outfalls at Fields Brook. Any spills on site may have caused damage also.

01 ■ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (include name(s) of species)
Contaminants may have migrated from Fields Brook to Ashtabula River. Ohio Dept. of Health / OEPA have issued a fish ban in the Ashtabula River.

01 ■ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
see Section K above.

01 ■ M. UNSTABLE CONTAINMENT OF WASTES (Spills/runoff/standing liquids/leaking drums) — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: ~36,000 — 04 NARRATIVE DESCRIPTION All wastes disposed off-site.
There were some containment deficiencies in past, which resulted in outfall discharges exceeding NPDES limits, (COD, TDS, Cl, pH); but Olin did remedy most of these problems. Unlined east pond and uncovered waste pile were also problems. During closure, all removed.

01 ■ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
unknown
Potential - Contaminants migrate to other areas in Fields Brook + Ashtabula River.

01 ■ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
During closure, did find contamination in outfall ditches + outfalls. Dredged and removed contaminated soil + sediment. Storm sewers vacuumed twice.

01 ■ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
unknown.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS
N/A

III. TOTAL POPULATION POTENTIALLY AFFECTED: 36,000

IV. COMMENTS
Olin Corporation closed December 8, 1982. Olin will be involved with a continuing USEPA study of the Fields Brook area.

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)
See attached sources of information.

ecology and environment

recycled paper

PA DOCUMENTATION SHEET

SITE OLIN CORPORATION
IDENTIFICATION NUMBER OHD001813708

SOURCE NUMBER	DESCRIPTION OF SOURCE
1A, 1B, 1C, 1D	1A) QUAD NAME Ashtabula North, OH SIZE: 7.5 or 15 YEAR 1960, photorevised 1970 1B) QUAD NAME North Kingsville, OH SIZE: 7.5 or 15 YEAR 1960, photorevised 1970 1C) QUAD NAME Astabula South, OH SIZE: 7.5 or 15 YEAR 1960, photorevised 1970 1D) QUAD NAME Gageville, OH SIZE: 7.5 or 15 YEAR 1960, photorevised 1979
2	Letter from Mark Rowland, Burgess + Niple, Ltd., to Issa Shamiyeh, Detrex Chemical Industries, Inc. 7/27/81 Re: Well information + well logs
3	ODNR Bulletin 44 "Geology of Water in Ohio" 1943
4	"Ohio Population Report" 20TH Federal Census, 1980
5	Telecom: Pat Petrella, (E+E, INC.) to Ohio-American Water Co, Mssrs. Ed Gastela, Joe Stuart 7/16/85 216-964-3777 216-997-7566
6	Telecom: Pat Petrella, (E+E, INC) to U.S. Fish+Wildlife Service. 7/16/85 10:30 AM 614-231-3416
7.	Telecom: Mary Jane Rupp, (E+E, INC.) to Doug Zahner, USDA, SCS, Jefferson, OH. 216-576-4946 7/18/85
8	Telecom: David Vaughn (E+E, INC) to Don Calhoun, OHIO Water Dept, Columbus, OH. 7-16-85 1:30 pm. 614-265-6746
9	Telecom: Pat Petrella (E+E, INC.) to Dan Sewell (E+E, INC.) 7-16-85 12:10 pm. 312-663-9415 Re: Groundwater wells
10	Well logs (12) and maps ODNR-Div. of Water, Columbus, OHIO

PA DOCUMENTATION SHEET

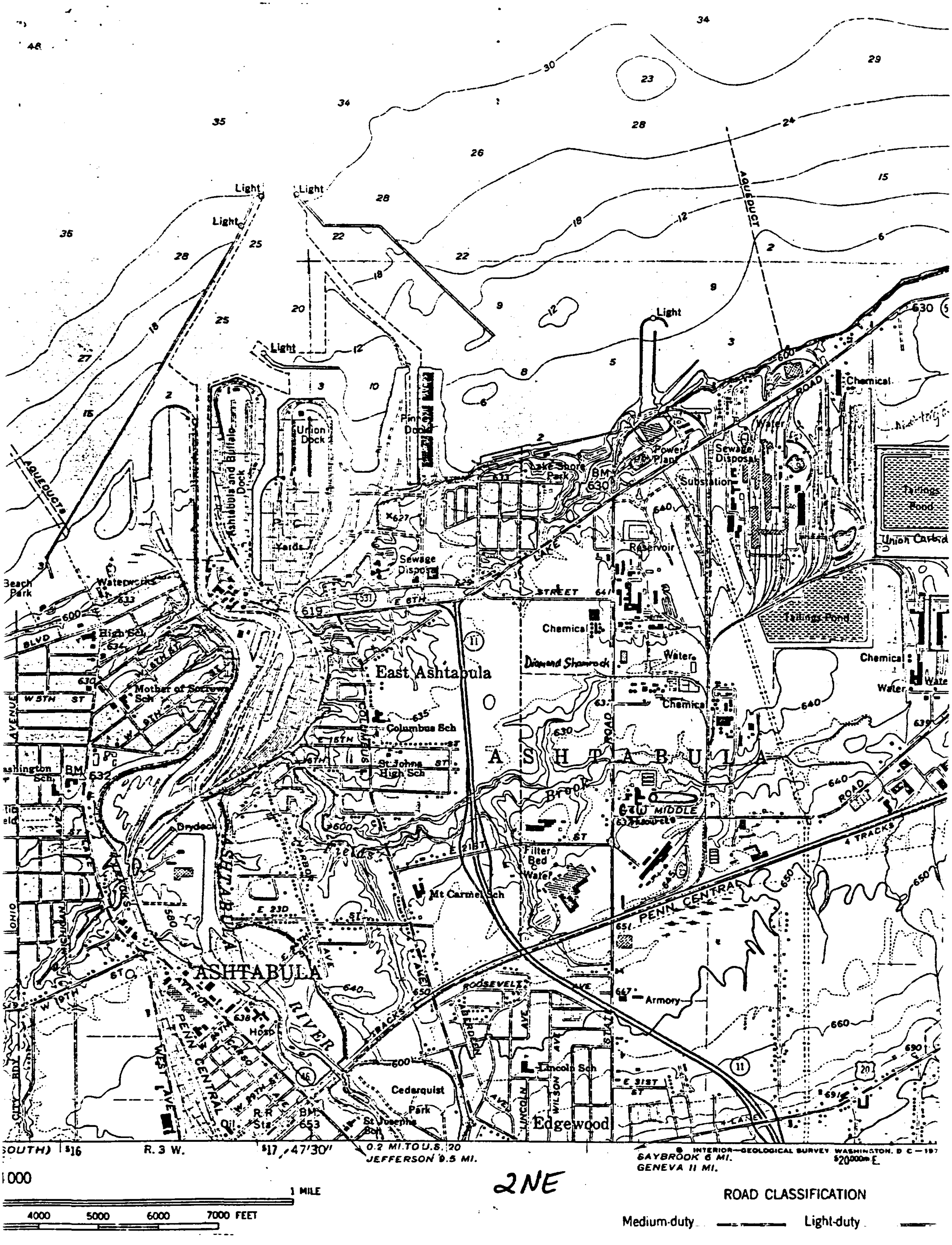
SITE OLIN CORPORATION
IDENTIFICATION NUMBER OHD 001813708

SOURCE NUMBER	DESCRIPTION OF SOURCE
11	U.S.EPA Gen. 1 FORM - submitted by Mr. W.A. Oppold, OLIN CORP. 11/10/80
12	USEPA FORM 3 RCRA - submitted by Mr. W.A. Oppold, OLIN CORP. 11/10/80
13	USEPA FORM 2C NPDES - submitted by Mr. W.A. Oppold, OLIN CORP. 9/30/80
14	USEPA "Notification of Hazardous Waste Site", + "Potential Hazardous Waste Site I.D. and P.A.", + several disposal facility letters Re: OLIN waste generation + off-site disposal information
15	Telecom: Pat Petrella, (E+E, INC) to Mr. Bender, Ashtabula City Recreation Dept. 1-25-85 11:20 AM
16	U.S.EPA RI/FS Report on "Fields Brook Site" 3/28/85 CH₂M Hill /E+E, INC. contract
17	OEPA Inter-office Communication Memo: To Paula Otter from Chris Frazier 7/30/84 Re: Olin Closure investigation
18	"Letter + Report and Certification of Closure Plan for Olin Chemical Corporation Plant" by Adache-Ciuni-Lynn Assoc., Inc. 3/22/83
19	Letter + sediment data from Olin Corp. to OEPA, Mr. Gary Gifford 9/29/82. Re: sediment data of Fields Brook.
20	OEPA inter-office communication to File from Chris Frazier 9/24/82 Re: closure status

PA DOCUMENTATION SHEET

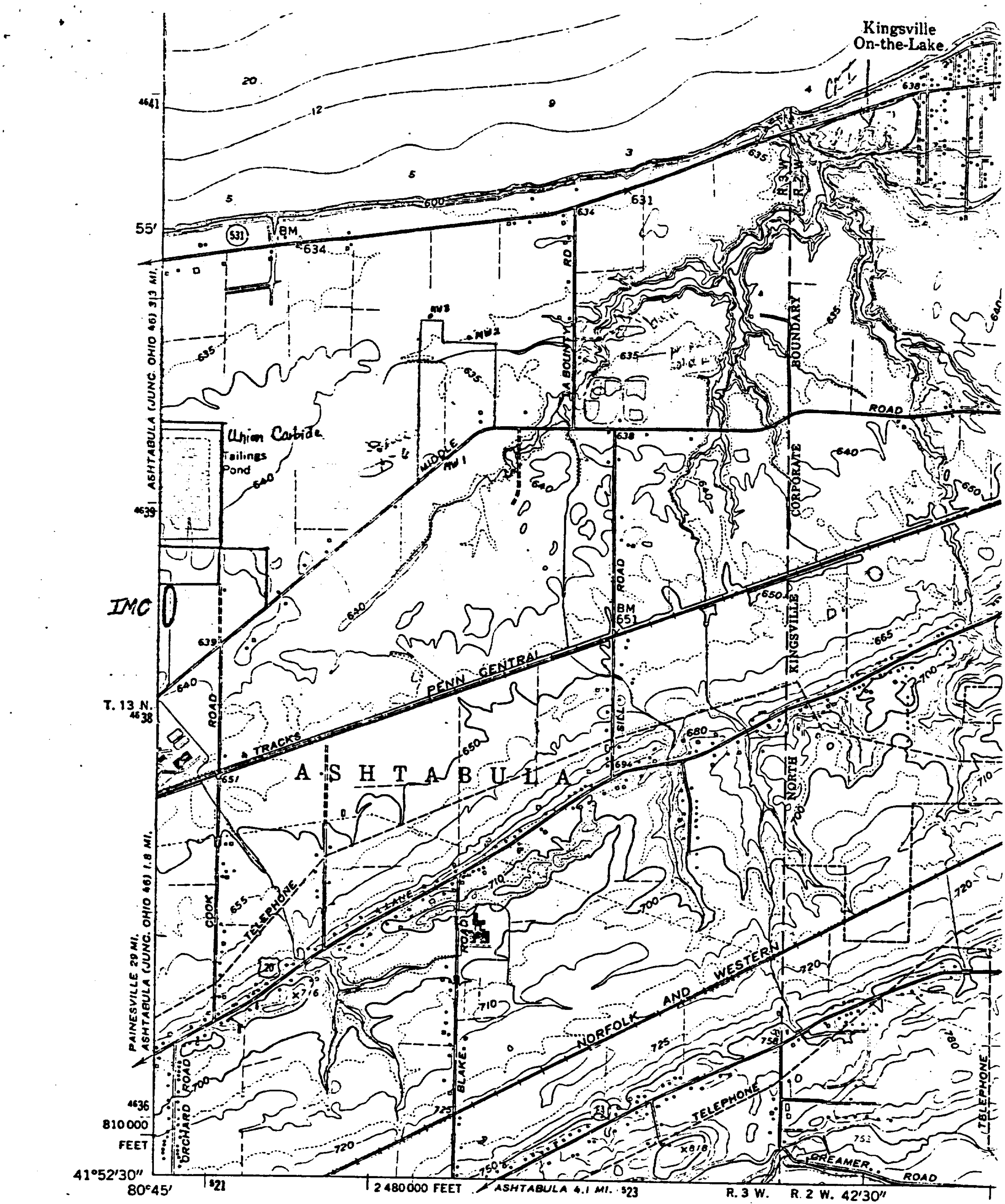
SITE OLIN CORPORATION
IDENTIFICATION NUMBER OHD001813708

SOURCE NUMBER	DESCRIPTION OF SOURCE
21	OEPA Site Inspection - Form A 9/14/81
22	1981 OEPA Industrial Compliance Sampling Inspection Report
23	Letter from Olin Corp to OEPA - Mr. W. Skowronski 12/29/80 NPDES incident
24	OEPA Incident Report 9/28/80
25	OEPA Enforcement Referral 5/6/80
26	USEPA Compliance Monitoring Field Report 1980
27	1979 OEPA Industrial Compliance Monitoring Report
28	OEPA telephone memo to Mr. Hendy, Olin from C. Frazier 4/8/82 - Re: pink sludge compounds
29	Letter from Olin to Gerry Rogers, USEPA 4/7/81. Re: Compliance audit summary
	END



Light
Light
Light
Light
Light
AQUEDUCT
AQUEDUCTS
Union Dock
Pinney Dock
Ashtabula and Buffalo Dock
Yards
Sewage Disposal
Lake Shore Park
BM 630
Power Plant
Sewage Disposal
Substation
Chemical
Water
Tailings Pond
Union Carbide
Reservoir
Beach Park
Waterworks
High Sch
BLVD
LAKE ROAD
STREET
E 6TH
Chemical
Diamond Shamrock
Water
Chemical
Water
East Ashtabula
Mother of Sorrows Sch
W 5TH ST
AVENUE
Columbus Sch
COLUMBUS
St Johns High Sch
Washington Sch
BM 632
A S H T A B U L A
Brook
MIDDLE
ROAD
4 TRACKS
Drydock
ASHTABULA RIVER
E 21ST
Filter Bed
Water
Mt Carmel Sch
E 23D ST
PENN CENTRAL
OHIO
MICHIGAN
ASHTABULA
W 19TH
TRACKS
ROOSEVELT
Armory
Hosp
Cederquist Park
Lincoln Sch
LINCOLN
WILSON AVE
STATE
E 31ST ST
R R Sta
BM 653
Oil
St Josephs Sch
Edgewood
WEST AVE
PENN CENTRAL
R. 3 W.
47'30"
0.2 MI. TO U.S. 20
JEFFERSON 9.5 MI.
SAYBROOK 6 MI.
GENEVA 11 MI.
INTERIOR—GEOLOGICAL SURVEY WASHINGTON, D C—197
520000m E.
1 MILE
4000
5000
6000
7000 FEET
ROAD CLASSIFICATION
Medium-duty
Light-duty

2NE



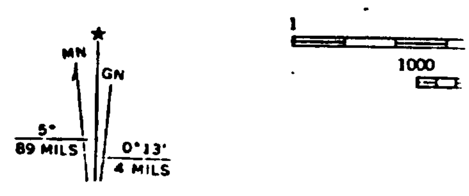
Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1958. Field check 1960

Selected hydrographic data compiled from U. S. Lake Survey charts 33 (1959) and 34 (1958). This information is not intended for navigational purposes

3NW



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Prepared by
Oak Ridge Associated Universities

Prepared for
Safety and Environmental Control Division:
Oak Ridge Operations Office

U.S. Department of Energy

ENVIRONMENTAL PROGRAM REVIEW

OF THE

RMI COMPANY EXTRUSION PLANT

ASHTABULA, OHIO

Radiological Site Assessment Program
Manpower Education, Research, and Training Division

FINAL REPORT
AUGUST 1985

RECEIVED
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OHIO EPA-N.E.D.O.

Environmental Program Review
of the
RMI Company Extrusion Plant
Ashtabula, Ohio

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Oak Ridge, Tennessee 37831-0117

Under Contract
DE-AC05-76OR00033
U.S. Department of Energy

FINAL REPORT

AUGUST 1985

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1.0 EXECUTIVE SUMMARY

An evaluation of the program for monitoring and controlling radioactive and non-radioactive contaminants in effluents and the environment of the RMI Extrusion Plant in Ashtabula, Ohio was conducted May 14 and 15, 1985. This evaluation included a review and assessment of the monitoring programs, procedures, equipment, and compliance with applicable federal and state regulations. No conditions or activities, which pose a threat to public health and safety or the environmental, were noted. The findings indicate general compliance with DOE and Ohio environmental protection regulations. Some minor regulatory deficiencies were identified; however, no evidence of serious deficiencies was obtained. In several areas additional data should be developed to confirm an acceptable level of environmental protection.

While state-of-the-art approaches and equipment may not be necessary for all RMI operations, the control and monitoring activities must be consistent with regulations, and should be in accordance with methods of "accepted good practice" for comparable industries and DOE's ALARA philosophy. With respect to these criteria, some aspects of monitoring procedures, documentation, and quality assurance are deficient. The present air and waste control systems are based on technologies of the 1960's and 1970's. Portions of these systems are in need of upgrading or replacement to assure that environmental health and safety will continue to be acceptable and that emissions from RMI activities will continue to meet proposed limits which may be more restrictive. The RMI staff has recognized many of the deficiencies and potential problem areas and has already initiated steps for further evaluation and/or improvements. Assistance in the form of technical guidance and funding support will be required from DOE to correct some of these deficiencies.

The remainder of this Section summarizes the findings and recommendations of this review. Additional information is to be found in the body of this report (Sections 3 through .9). It should be noted that in addition to the recommendations provided there may be alternative approaches which would be acceptable. Table 1-1 summarizes the recommendations from this review according to categories of short-term and long-term priorities.

Staffing

The Health, Safety, and Security staff demonstrates a positive and receptive attitude and initiative, necessary to the achievement of an effective environmental program. Environmental health and safety also receives strong support from Plant Management and the RMI Corporate Organization. However, recent regulatory actions have resulted in expanding the scope of the Health, Safety, and Security staff responsibilities and increasing the overall workload. The staffing level is not adequate to conduct a comprehensive program for worker, faculty, and environmental protection as currently assigned.

This situation has been recognized and additional professional and technical level personnel are being recruited. Following completion of staffing, special initial training in areas of environmental regulation and monitoring will be required, with periodic participation in appropriate professional meetings and workshops a necessity.

Air Effluent Control and Monitoring

The major air emission sources at RMI are the ventilation systems for the abrasive saw, forge booths, and scrap incinerator. Only the incinerator system presently has emissions control equipment, that is effective in reducing airborne uranium releases. RMI and DOE/OR have recognized deficiencies in plant ventilation and have contracted with Lockwood-Greene for a plant-wide evaluation and upgrade design. Preliminary results have been received and are being reviewed. Plans to upgrade (including installation of emission control) the abrasive saw system should proceed immediately. The incinerator and forge booths ventilation systems should also be considered for improvement as soon as possible.

Grab sampling presently being performed in the stacks is representative but provides information on only a small fraction (<5%) of the emissions. Since the emissions from stacks 4, 5, and 6 have been consistently high and variable, continuous monitoring of these stacks is recommended; the monitoring frequency of the other stacks should also be increased. A minimum sampling frequency of weekly is recommended, although continuous monitorng would be preferrable. Sampling locations for stacks 1, 2, 3, and 6 should be reevaluated now and all stack sampling locations should, of course, be reconsidered as ventilation systems are upgraded.

Air monitoring is performed at 5 locations on the plant perimeter. The uranium concentration measured at these locations indicate compliance with DOE environmental regulations. However, the sample locations were selected without a thorough evaluation of the local meteorology, stack heights, and possible building effects on air discharges. It is therefore possible that samples from the locations may not be truly representative of uranium concentrations at the plant perimeter. After upgrading of ventilation systems and acquisition of new emissions data, dispersion and modeling calculations should be performed. From these results it can be determined if further perimeter or off-site monitoring is required and, if so, where stations should be located.

Analytical procedures for stack and air samples are adequate to detect less than 1/10 of the DOE unrestricted area guideline for insoluble uranium. Computations are performed correctly, but some data and procedures are not documented in an auditable form. Also periodic determination (annual initially suggested) of particle size distributions, lung solubility class, and other radionuclide contaminants, normally present in uranium from FMPC, is recommended. A quality assurance program is needed for air sample analysis.

RMI uses dispersion factors, obtained from the EPA Workbook of Atmospheric Dispersion Estimation, to estimate off-site air concentrations. Such factors do not allow for consideration of site specific effects, such as building downwash, short stack heights, and local meteorology. There is no on-site meteorological monitoring data; however, a decision regarding the need for such a monitoring system at RMI should be delayed, pending completion of ventilation upgrades and evaluation of air emission levels after addition of stack controls.

Calculations of population doses in the vicinity of RMI have been performed by Oak Ridge National Laboratory, using 1984 air emissions data. The results confirm that RMI is in compliance with NESHAP. Records also demonstrate that RMI is in compliance with effluent limitations identified in their OEPA air permits.

Water Treatment and Monitoring

The RMI equipment and procedures for treatment and monitoring of wastewater effluent are generally adequate and, with minor exceptions, satisfy current standards. Routine sampling of the effluent indicates very few exceedances of the NPDES permit limits and OEPA has issued no notices of violation. New, more restrictive, permit limits have been proposed by OEPA and RMI has been corresponding with OEPA regarding these limits. This issue is yet to be resolved among RMI, OEPA, and USEPA.

In anticipation of more restrictive NPDES permit limits, RMI has initiated plans to upgrade the sanitary sewage treatment facility and increase removal of uranium from process water. The latter has been proposed for installation by February 1986 (based on available funding) and should reduce uranium releases by a factor of approximately 20.

Sampling and analytical procedures require better documentation, and an equipment calibration program should be developed. Although the sampling procedure and equipment satisfy present NPDES requirements, this may not be the case, when the new permit becomes effective. Discussions with OEPA regarding new sampling requirements should be initiated. Also, data on uranium concentrations during periods of heavy precipitation runoff is needed to determine if such runoff is carrying uranium contaminated particulate from the property. Further actions such as the need for runoff control measures, or installation of an effluent metering and proportional sampling system can then be evaluated.

Analyses do not currently include the radiological contaminants, which have been identified in FMPC uranium; an annual liquid effluent composite should be analyzed for these materials. The Health, Safety, and Security section does not have a quality assurance program for U.S. Testing's analytical services, and such a program should be developed and implemented as soon as possible.

Revision of the Spill Prevention Control and Countermeasures Plan is underway by Battelle as part of an overall upgrading of the RMI waste management plan. Internal procedures appear to be effective in identifying and reporting spills. Training is provided and material for spill control is maintained at appropriate locations throughout the facility.

Soil, Sediment, and Vegetation Monitoring

Procedures for monitoring soil, sediment, and vegetation are not well documented. These procedures should be revised to be consistent with standard or generally accepted methods and should include a methodology for selecting sampling locations, provisions to determine soil contamination profiles, and methods of identifying sampling locations adequately to permit trend evaluations.

There is not an adequate understanding of the vendor laboratory's sample preparation and analysis procedures. RMI conducts no formal evaluations of the laboratories performance. Composite samples should be analyzed for other potential radionuclides, which have been identified in uranium from FMPC.

Soil sample results have identified off-site uranium contamination, believed by RMI to be primarily the result of air emissions. Sediment samples from Fieldsbrook also contain elevated levels of uranium. On-site soil uranium levels suggest that precipitation runoff may also be a source off-site contamination along the northern perimeter and in Fieldsbrook. A comprehensive survey of off-site contamination levels in the environment of RMI should be performed. Results of this survey should be compared to guidelines endorsed by DOE to evaluate whether any remedial actions are warranted.

Waste Management

RMI has developed a Waste Classification and Analysis Plan and has filed with OEPA as a hazardous waste generator and storer. Battelle is reviewing all waste management activities and preparing the RCRA Part B permit application.

The quantity of stored uranium contaminated hazardous waste is about to exceed the storage capacity at RMI; unless this is resolved, RCRA violations may result. Other wastes, such as sanitary sewage sludge and general trash, are removed from the plant for disposal at local facilities. Thorough monitoring of these wastes is not performed prior to their release.

The only known on-site disposal area was a small pond for disposal of neutralized nitric acid. This pond was excavated and backfilled in mid-1984. Contaminated sludge and soil from this pond is stored, awaiting disposal. Building rubble and metal scrap with low-level uranium contamination is also awaiting disposal. The pond sludge and other non-hazardous wastes are subject to weathering, and their location near the north perimeter fence may be sources of uranium migration from the site by runoff. If these materials cannot be removed in the immediate future, actions to prevent potential migration will be necessary.

Waste classification procedures indicate that solid wastes containing less than 50 mg/l of natural or depleted uranium may be handled and disposed of as non-radioactive material. Such a level could exceed allowable environmental concentrations. This "de-minimis" concentration should be reevaluated and provisions should be included for surface contamination levels and uranium concentrations in materials that cannot be measured in units of liters.

Quality Assurance Program

RMI's Quality Assurance Program does not satisfy the requirements of DOE Order 5700.6A with respect to environmental health and safety. The

Health, Safety, and Security section does not conduct quality control tests of counting equipment and does not monitor the performance of the outside analytical laboratory. No internal QA audits are performed. The quality assurance program must be upgraded to adequately support the environmental monitoring program. The program improvements should include appointment of a plant QA supervisor, with more direct reporting lines to upper management.

Miscellaneous

Hand calculations of environmental data, appear correct; however, no minimum detectable levels or data uncertainties (errors) are determined. Computerization of data was begun recently. Previous records are legible, signed, and dated, although several report forms reviewed did not include thorough support information.

Some non-hazardous wastes and commercial products require more thorough surveys for radioactive contamination, prior to their release from the RMI plant. These include general refuse, sanitary treatment sludge, and non-uranium extrusions for the private sector. A program to assure and document contamination surveys of such materials should be developed and implemented immediately.

Emergency procedures are being reviewed by Battelle. It appears that the level of preparedness is commensurate with the degree of potential impact from postulated creditable accidents. State, regional, and local response groups possess adequate radiological capabilities; this is due primarily to the presence of the nearby nuclear power plant.
Dames and Moore is conducting a study to determine potential groundwater contamination resulting from RMI activities, including the previous nitric acid neutralization pond, results are expected before August 1985. If the findings of this study indicate groundwater contamination, an appropriate monitoring program should be developed.

TABLE 1-1

SUMMARY OF RECOMMENDATIONS AND SUGGESTED PRIORITIES

SHORT TERM PRIORITY (To Be Accomplished Within Approximately One Year)

1. Initiate improvements to the emission controls for the abrasive saw; consider improvements to the scrap incinerator and forge booth ventilation systems.

2. Begin continuous monitoring of stacks 4, 5, and 6. Increase frequency of sampling stacks 1, 2, and 3 to a minimum of weekly - continuous monitoring would be preferrable.

3. Arrange for a comprehensive survey of radionuclide contamination in off-site soil.

4. Obtain and analyze samples of surface runoff and roof drainage water to determine if these are significant pathways for off-site migration of uranium particulates.

5. Develop and implement a program for monitoring to assure that general trash, sanitary sludge, and non-uranium products for the private sector are not contaminated with uranium.

6. Dispose of accumulated hazardous and contaminated wastes.

7. Complete staffing of the Health, Safety, and Security section and initiate training in areas of environmental monitoring and control.

8. Complete planned upgrading of sewage treatment facility.

9. Continue to work with Battelle on review and improvement of overall RMI waste management activities. Implement recommendations of that study as appropriate.

TABLE 1-1 (Continued)

10. Begin including error values with data. This also includes data provided by vendor laboratories.

11. Reevaluate the "de-minimis" concentration level established for classification of non-radioactive waste.

12. Obtain a copy of analytical procedures used by U.S. Testing for RMI samples. Request that data reports from U.S. Testing be signed and dated by a representative of that organization.

13. Obtain NBS traceable calibration sources and check sources for use with NMC proportional counter. Initiate a program of quality control for this system.

14. Determine, based on the Dames and Moore study, whether a groundwater monitoring program is required. If so, develop and implement such a program.

15. Implement procedures for periodic calibration of the liquid effluent sampler.

16. Test main piping and process water sumps for leakage.

17. If disposal of contaminated pond sludge, rubble, and scrap is delayed more than several months, cover material and/or construct berms to control runoff.

18. Initiate a program for determining particle size distributions and lung solubility classifications for air emissions.

LONG-TERM PRIORITY (May Require In Excess Of One Year To Accomplish)

1. Evaluate needs for upgrading emission controls on exhaust ventilation systems 1, 2, 3, and 7.

TABLE 1-1 (Continued)

2. Analyze composite samples of air and water effluents, soil, sediment, vegetation, sludge, and other environmental media for radionuclides other than uranium.

3. Complete planned upgrading of process water treatment facility.

4. Evaluate the current liquid effluent sampler with respect to the proposed NPDES requirements.

5. Prepare detailed procedures for sampling all effluents and environmental media of concern.

6. Evaluate the results of the soil contamination survey in the vicinity of RMI.

7. Upgrade the plant QA program to be consistent with DOE Order 5700.6A. Initiate internal audits and performance monitoring of vendor analytical laboratories. Reassign QA supervisor responsibility to an individual with more direct lines to management.

8. Provide QA training for the plant management staff.

9. After planned upgrades of ventilation systems are completed, evaluate need for continuous stack monitoring, based on effectiveness of emission control improvements.

10. Evaluate need for perimeter or off-site air monitoring, based on effectiveness of air emission control improvements. If air stations are required, perform modeling to substantiate their locations.

11. After upgrading of emissions controls is completed, evaluate the need for an on-site meteorological station.

2.0 INTRODUCTION

2.1 Purpose and Scope

At the request of the U.S. Department of Energy's Oak Ridge Operations Office (DOE/OR) in Oak Ridge, Tennessee, Oak Ridge Associated Universities (ORAU) performed a review of the effluent and environmental monitoring program at the RMI Company Extrusion Plant in Ashtabula, Ohio. This review was performed May 14 and 15, 1985, by Mr. James D. Berger, Manager of the ORAU Radiological Site Assessment Program (see Appendix A). Mr. Vincent Fayne of the DOE/OR Environmental Protection Branch participated in the review as an observer and facilitator.

The review was a comprehensive technical assessment of the RMI program for management of wastes and monitoring plant effluents and environmental contamination levels. Appendix B contains the scope of work issued by DOE/OR for this review. Both radioactive and non-radioactive wastes and contaminants were considered. Included in the review were the plant's organizational structure and staffing as related to environmental activities; sampling methodologies, equipment, and procedures; analytical techniques; quality assurance; and computational and data processing methods. Field observations of effluent release points, sampling equipment, and waste storage sites were conducted. Compliance with applicable federal and State of Ohio environmental protection requirements was also evaluated. Appendix C is a list of documents reviewed as part of the evaluation.

The Argonne National Laboratory document, Internal Environmental Protection Audits: A Suggested Guide for U.S. Department of Energy Facilities, (ANL/EES-TM-237), August 1983, was used to guide the information gathering process. RMI personnel contacted during the review included:

M.R. Schaeffer; Plant Manager
F.G. Van Loocke; Supervisor - Health, Safety, and Security
J. Steudler; environmental specialist

J. Cline; health and safety techinician

J. Rapose; laboratory techinician

J.T. Holman; RMI corporate Environmental Control Supervisor

Items of concern noted during the review were brought to the immediate attention of plant personnel. A brief close out presentation was made by Mr. Berger on the afternoon of May 15, identifying those areas where major deficiencies or potential problems were felt to exist.

A list of suggested references on environmental and effluent monitoring has been included as Appendix D of this document.

2.2 Site Description and Operations

The RMI Extrusion Plant is located on East 21st Street, about 5 kilometers east of the city of Ashtabula, Ohio (see Figure 2-1). The 10.5 hectare property is privately owned by the RMI Company of Niles, Ohio, a subsidiary of U.S. Steel and National Distillers. Operations are confined to the 2.8 hectare secured (fenced) plant area shown on Figure 2-2. The site contains seven main buildings plus a guard house and an unoccupied office building. RMI operates the plant under DOE prime contract No. DE-AC05-76OR01405, administered by the Oak Ridge Operations Office. The site is also licensed for commercial (non-DOE) activities under Nuclear Regulatory Commission Source Material License SMB-602. Operations at the Extrusion Plant began in 1962; current employment is 117 persons, working 3 shifts per day, 5 days per week.

Three of the main buildings, most of the contents of these three buildings, a 3850 ton Loewy extrusion press, and some support equipment are owned by DOE. The principle DOE operation of the RMI Extrusion Plant is the extrusion of depleted or slightly enriched uranium ingots into tube or billet shapes using the Loewy hydropress. Ingot feed material is provided from the DOE-owned Feed Materials Production Center (FMPC) in Fernald, Ohio. The depleted uranium tube product from RMI is returned to the FMPC for "finishing" before shipment to the Savannah River Plant near Aiken, South Carolina, for use in production reactors. Slightly enriched billets are shipped directly from RMI to

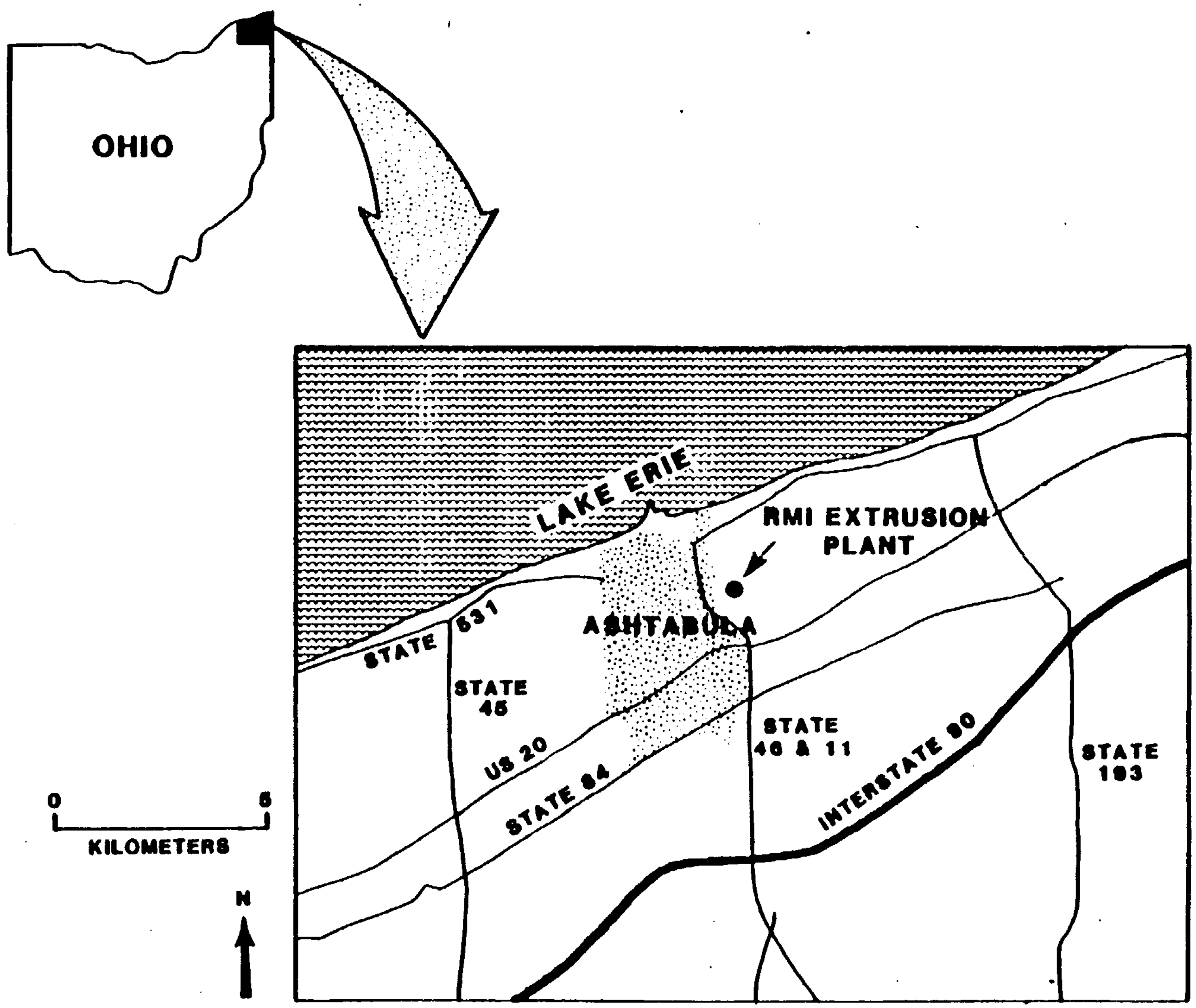


FIGURE 2-1: Ashtabula, Ohio Area Indicating the Location of the RMI Company Extrusion Plant.

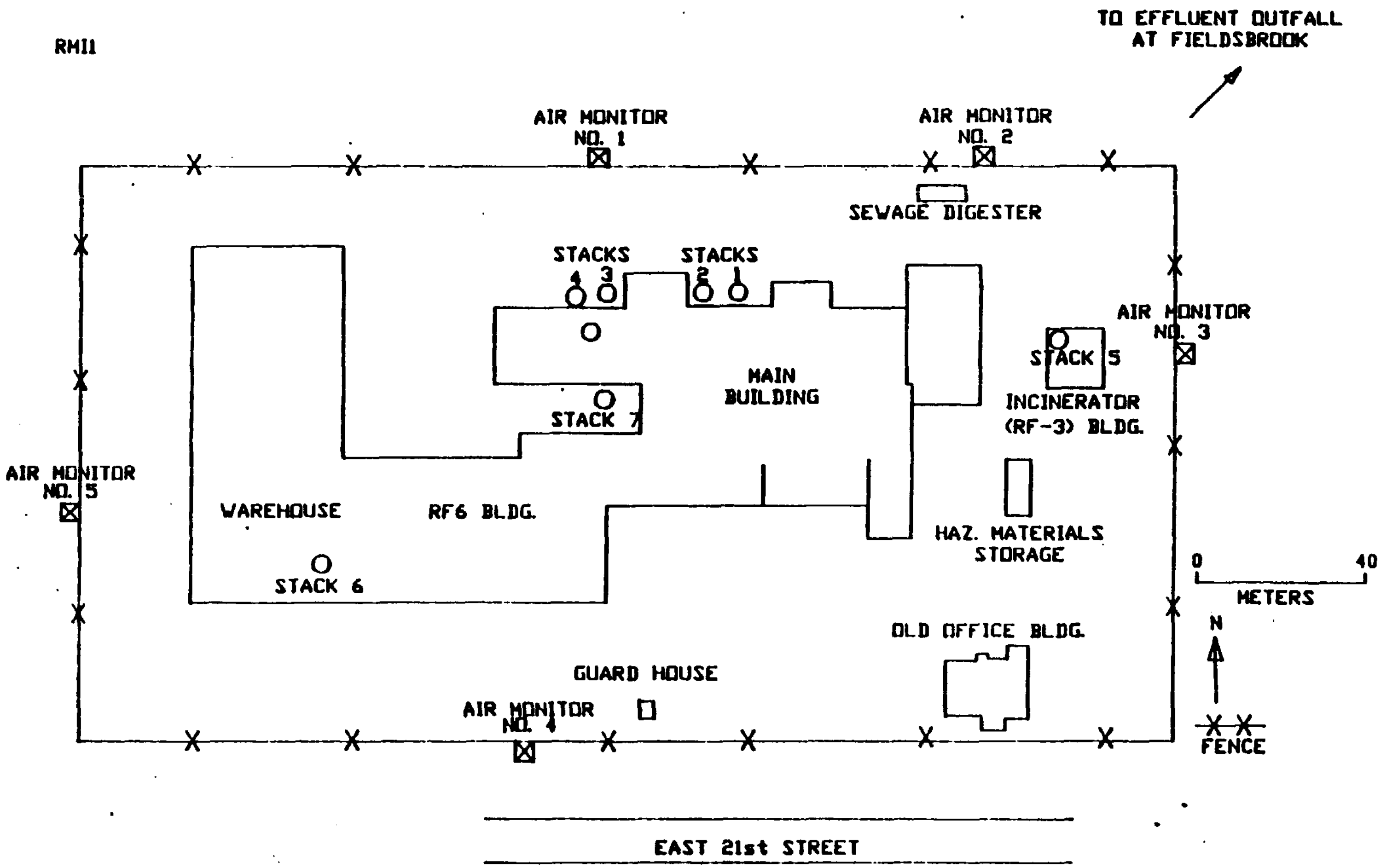


FIGURE 2-2: General Layout of the RMI Extrusion Plant, Showing Effluent Release Points.

the Hanford Reservation in Richland, Washington, for fabrication into fuel elements for the N-Reactor. Process flow charts are presented in Figures 2-3 to 2-5.

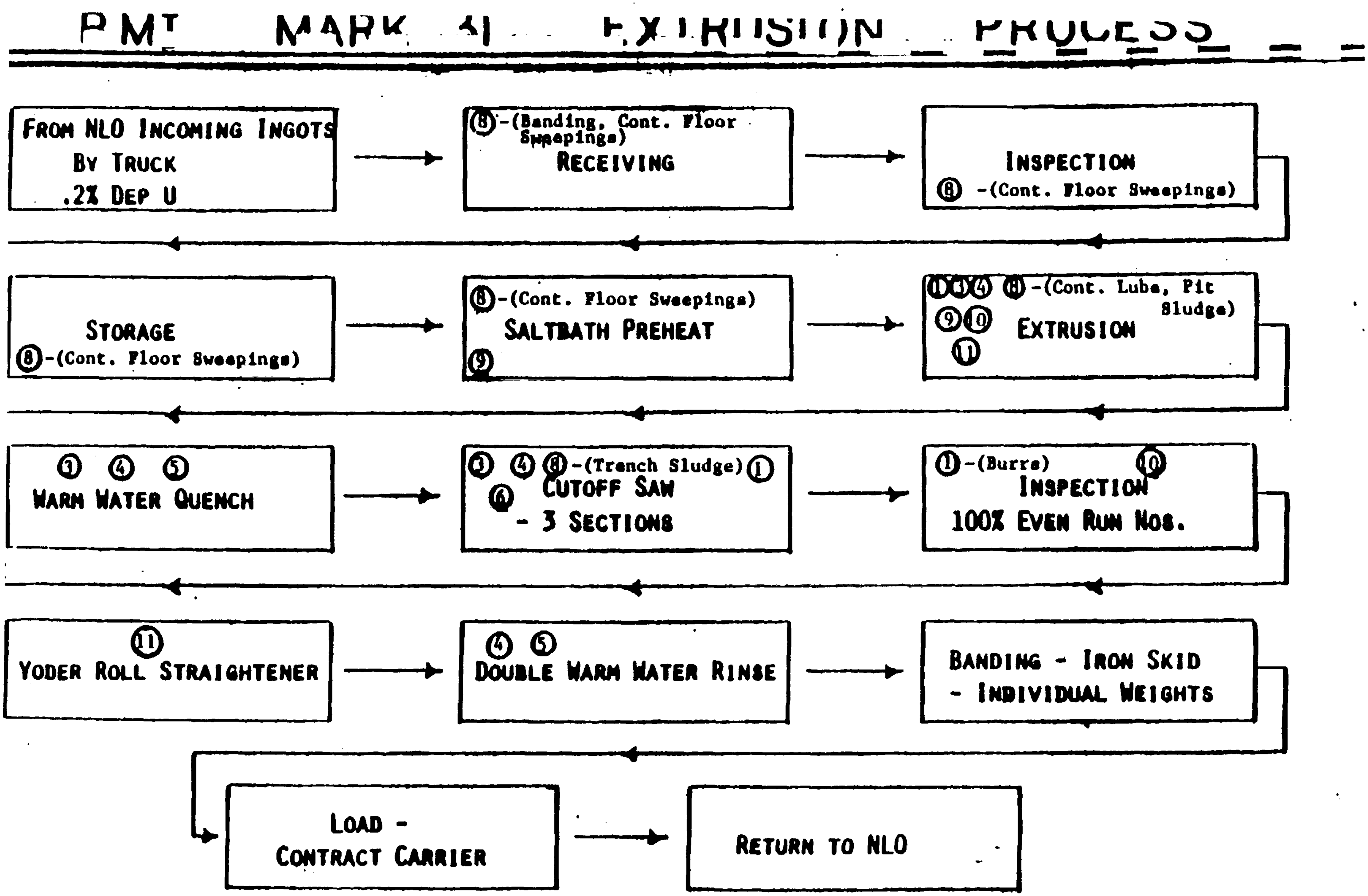
Under special arrangements with the Department of Energy, the RMI Extrustion Plant also performs extrusions for the private sector, i.e. non-DOE organizations. This work includes depleted uranium extrusions under the NRC license and extrusions of the more traditional metals such as copper, zirconium, titanium, and molybdenum for commercial firms. Some beryllium and uranium-niobium alloys have also been processed. Table 2-1 contains a summary of activities for DOE, NRC, and other customers from 1962-1984.

The plant is located in an industrial community of chemical and metal processing operations. The immediate area is sparsely populated; the nearest resident has been identified as being approximately 100 meters NNE of the plant. Table 2-2 is a summary of the population distribution within 48 km (30 miles).

Exhaust ventilation discharges are through seven stacks. Liquid effluents are discharged into Fieldsbrook at the northeast boundary of the RMI property. Uranium dioxide (UO_2) is considered by RMI to be the principle contaminant in effluents. Other uranium contaminated wastes from DOE activities are processed on site, as appropriate, and then transferred to the Feed Materials Production Center for uranium recovery and/or final disposal (see Figure 2-6).

2.3 Plant Administration And Organization

Management and operation of the RMI Extrusion Plant is under the direction of Mr. R.M. Schaeffer, Plant Manager (see Figure 2-7). Mr. F.G. Van Loocke is the supervisor of Health, Safety, and Security; this section includes responsibilities for environmental control and monitoring. The Health, Safety and Security section reports to the Assistant Plant Manager (a position currently vacant). The Laboratory and QA section, under Mr. L.H. Chapman, also reports to the Assistant Plant Manager.

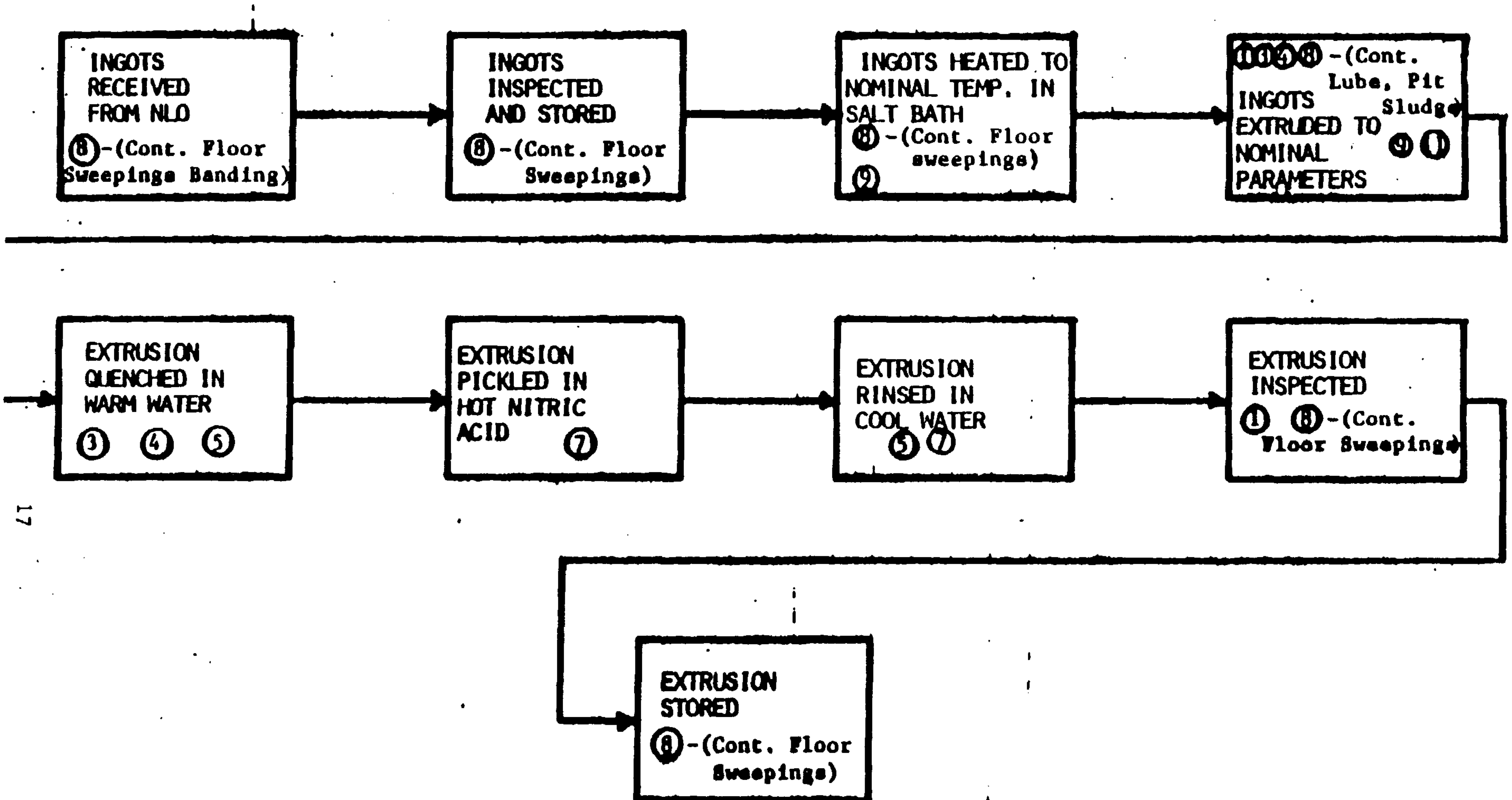


KEY

1) Solid Scrap (For Remelt)
2) Solid Scrap (To Incinerator)
3) Oxide (Airborne)
4) Oxide (Waterborne)
5) Oxide (Quench Sludge)
7) Uranyl Nitrate (In HNO_3)
8) Misc. Residue (Described in Parenthesis)
9) Contaminated Salt Bath Sludge, Salt
10) Contaminated Dry Residue
11) Contaminated Lathe or Machinery Coolant Oil

FIGURE 2-3: Extrusion Process Flow Chart for Savannah River Elements.

RMI " REACTOR PRIMARY EXTRUSION PROCESS



KEY

1) Solid Scrap (For Remelt)
2) Solid Scrap (To Incinerator)
3) Oxide (Airborne)
4) Oxide (Waterborne)
5) Oxide (Quench Sludge)
6) Filtered Residue
7) Uranyl Nitrate (In HNO_3)
8) Misc. Residue (Described in Parenthesis)
9) Contaminated Salt Bath Sludge, Salt
10) Contaminated Dry Residue
11) Contaminated Lathe or Machinery Coolant Oil

FIGURE 2-4: Extrusion Flow Chart for N-Reactor Elements.

RMI N-REACTOR FORGED BILLET PROCESS

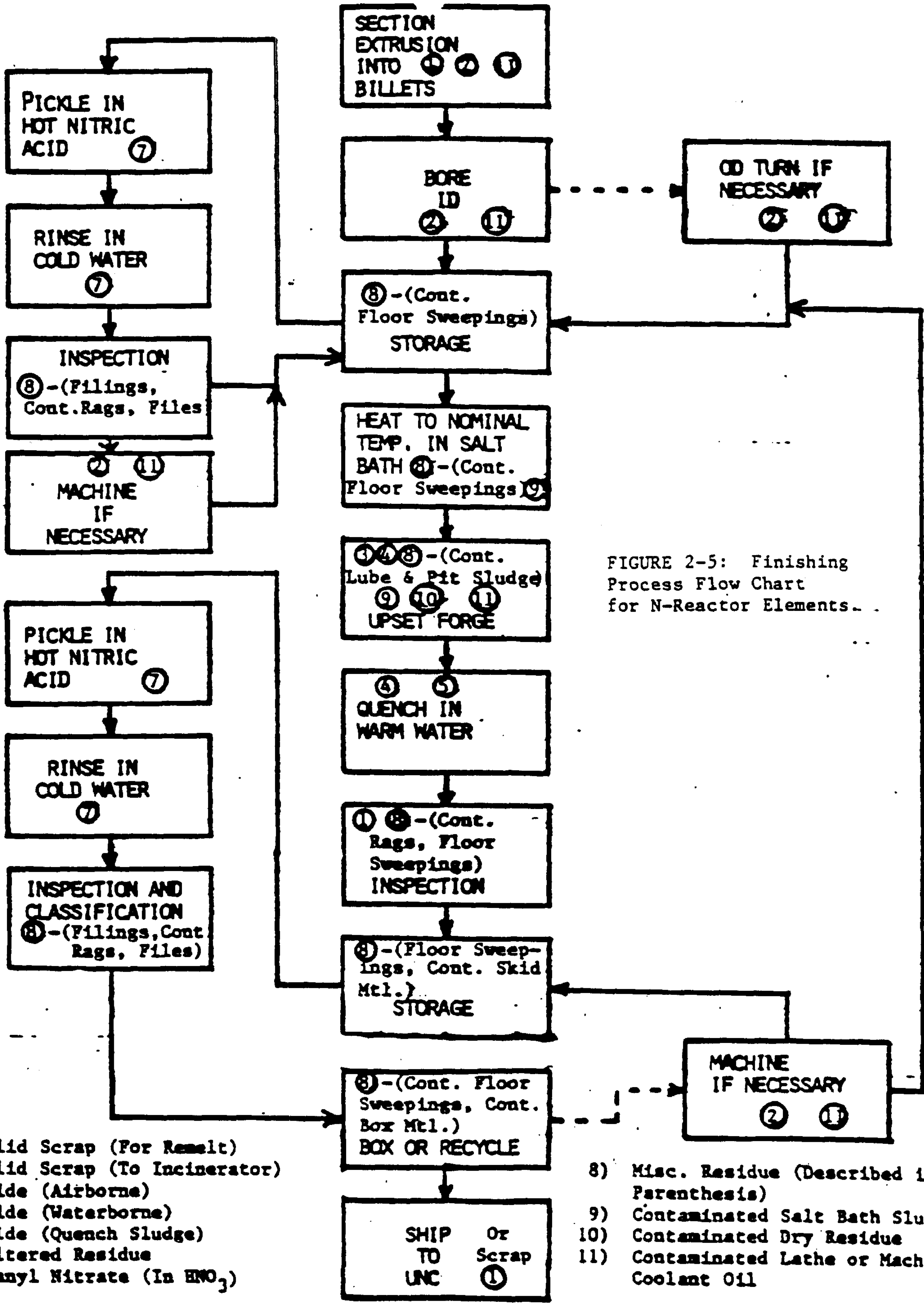
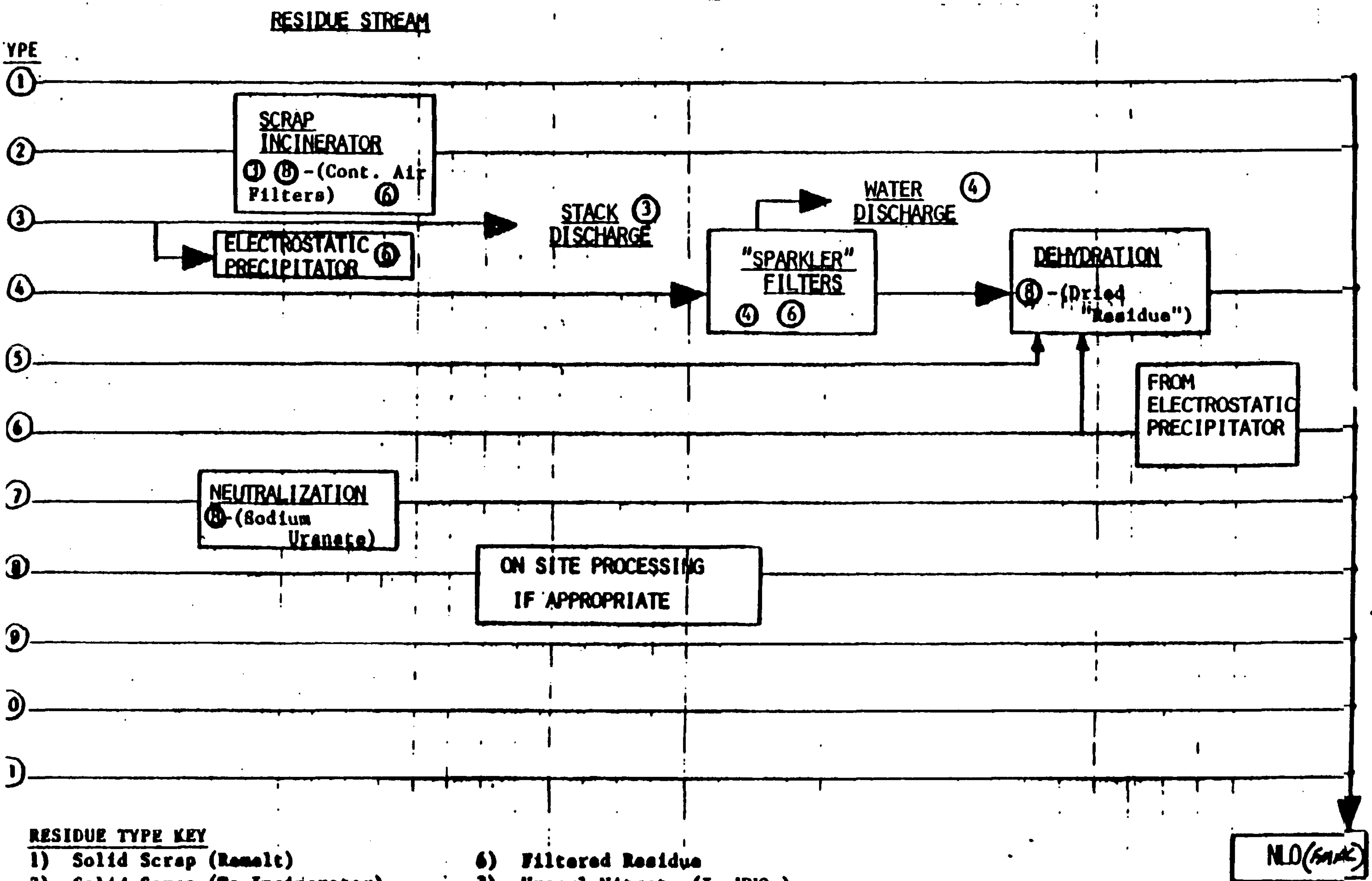


FIGURE 2-5: Finishing Process Flow Chart for N-Reactor Elements.

KEY

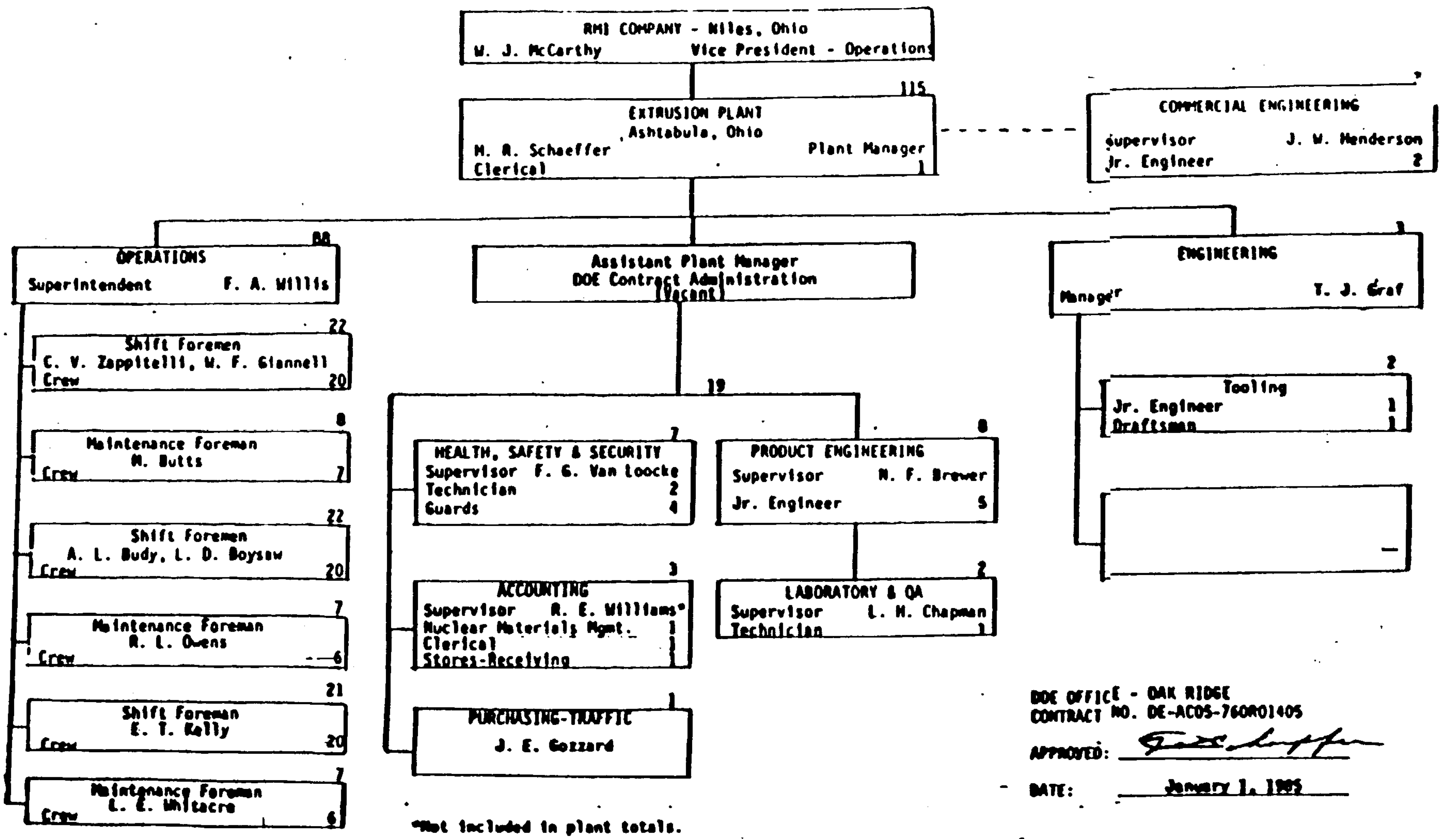
1) Solid Scrap (For Remelt)
2) Solid Scrap (To Incinerator)
3) Oxide (Airborne)
4) Oxide (Waterborne)
5) Oxide (Quench Sludge)
6) Filtered Residue
7) Uranyl Nitrate (In HNO_3)
8) Misc. Residue (Described in Parenthesis)
9) Contaminated Salt Bath Sludge,Sa
10) Contaminated Dry Residue
11) Contaminated Lathe or Machinery Coolant Oil



RESIDUE TYPE KEY

1) Solid Scrap (Remelt)
2) Solid Scrap (To Incinerator)
3) Oxide (Airborne)
4) Oxide (Waterborne)
5) Oxide (Quench Sludge)
6) Filtered Residue
7) Uranyl Nitrate (In HNO_3)
8) Misc. Residue (Described in Parenthesis)
9) Contaminated Salt or Salt Bath Sludge
10) Dry Contaminated Residue
11) Contaminated Lathe or Machinery Coolant Oil

FIGURE 2-6: Process Waste and Residue Summary.



DOE OFFICE - OAK RIDGE
CONTRACT NO. DE-AC05-76OR01405

APPROVED: ________

DATE: January 1, 1985

FIGURE 2-7: RMI Extrusion Plant Organizational Chart

TABLE 2-1

SUMMARY OF SITE OPERATIONS FY 1962-1984
IN % OF CAPACITY UTILIZED BY DOE, NRC AND ALL OTHER METALS

FY	DOE	NRC	ALL OTHER
1984	48	11	41
1983	47	31	22
1982	37	40	23
1981	30	35	35
1980	26	30	44
1979	30	17	53
1978	41	13	46
1977	49	8	43
1976	49	5	46
1975	54	1	45
1974	71	0	29
1973	75	0	25
1972	77	1	22
1971	71	1	28
1970	66	0	34
1969	80	0	20
1968	74	0	26
1967	66	1	33
1966	83	0	17
1965	90	1	9
1964	99	0	1
1963	100	0	0
* 1962	100	0	0

* Records from startup in January, 1962 through September, 1962 are sketchy. Press utilization by DOE assumed at 100% based on FY 1963 actual records for the period October, 1962 - June, 1963.

TABLE 2-2

POPULATION DISTRIBUTION WITHIN 30 MILES
OF
RMI COMPANY EXTRUSION PLANT

COMPASS SECTOR	ESTIMATED POPULATION *					
	0-5 MILES	5-10 MILES	10-15 MILES	15-20 MILES	20-25 MILES	25-30 MILES
North	120	0	0	0	0	0
North-Northeast	120	0	0	0	0	0
Northeast	470	0	0	0	0	0
East-Northeast	1060	4400	6720	2000	2500	2500
East	1060	2610	5850	1500	2000	2500
East-Southeast	1060	820	1530	1000	1500	2000
Southeast	1060	765	975	960	1300	1500
South-Southeast	670	800	1050	900	1285	1530
South	706	870	4220	601	1290	1500
South-Southwest	1060	1530	1460	1207	1520	2040
Southwest	14130	2480	1940	1785	2000	2500
West-Southwest	14130	2730	2860	2000	2500	3000
West	1180	50	0	0	0	0
West-Northwest	1180	0	0	0	0	0
Northwest	118	0	0	0	0	0
North-Northwest	118	0	0	0	0	0
Total	37,062	17,055	26,005	11,953	15,895	19,070

Total All Sectors = 127,040

* Estimated using 1980 census data.

3.0 STAFFING

Findings

- The Health, Safety, and Security section presently has two professional level staff members - one with a background primarily in general safety and health physics; the other with a background in chemistry, environmental control, and laboratory operations (the latter had been on the staff for only 2 months at the time of the review).

- There are two technicians and four security guards in the Health, Safety, and Security section.

- An additional professional level health physicist/industrial hygienist is being recruited and two more technician slots have recently been authorized. The addition of these personnel should provide an adequate level of staffing with coverage of critical disciplines.

- The RMI corporate health, safety, and environmental control programs are still developing. The Extrusion Plant staff has therefore received only limited assistance from the corporate office relative to environmental matters.

- Because of the previous small staff it has not been possible for professional level personnel to participate in outside training to the extent necessary to remain up-to-date with the rapidly developing field of environmental regulations, monitoring, and control.

- The RMI Health, Safety, and Security staff has not been actively involved by DOE/OR in DOE contractor environmental health and safety meetings, conferences, workshops, and training. OR has recognized this deficiency and has taken steps to increase RMI involvement.

° The current Health, Safety, and Security staff has an open, receptive attitude; individuals contacted displayed an eagerness to increase basic knowledge and correct shortcomings. It appears that there is ample initiative and capability to implement an acceptable environmental control program, given adequate staffing, funding, training, and general direction.

Recommendations

Complete the current staffing upgrade plan. Then evaluate the available staff knowledge and experience base and provide additional training in areas of environmental regulation and monitoring, as appropriate. Working visits to a major DOE contractor facility with similar operations and activities; use of short term outside consultants; and/or temporary (1-2 months) reassignment of professional level staff to RMI from a major DOE contractor facility are possibilities which should be explored.

Provide opportunities for staff to regularly participate in meetings, workshops, and short courses relative to environmental and effluent monitoring and control.

4.0 AIR EFFLUENT CONTROL AND MONITORING

4.1 General System Description

Operations with a potential for generating airborne contamination are provided with local exhaust ventilation. There are seven major exhaust ventilation systems; these are:

Stack Number	Major Operation
1	Extrusion Press
2	Extrusion Runout Table
3	Extrusion Cooling Table
4	Abrasive Saw
5	Scrap Incinerator
6	Forge Booths
7	Pickling Tanks

The principle stack effluent contaminant in stacks 1 through 6 is uranium in the form of UO_2. The other major potential contaminant is oxides of nitrogen, from nitric acid pickling operatings on stacks 6 and 7. Stack discharges are at or slightly above ambient work place temperatures. Moisture levels are not generally high; however, coolants in the abrasive saw exhaust are occassional concerns. The abrasive saw exhaust (number 4) is equipped with an electrostatic precipitator. This precipitator, installed approximately 1 year ago, has not performed according to design specifications; corrective action is planned. Stack 5, the scrap incinerator in building RF-3, has a water scrubber (American Air Filter, Type N Rotoclone) followed by 2, 95% particulate filters. Stacks 1, 2, 3, 6, and 7 have no emissions control systems. Stacks extend approximately 1.5-2.0 meters above the roofs of their respective buildings; there are no rain caps or offsets on the stack discharges. Locations of the stacks are indicated on Figure 2-2.

Grab sampling is performed in stacks 1 through 6 using a Kurz Model 271 automatic isokinetic sampler system. Particulate samples are collected on 47 mm diameter Whatman 41 filter paper. Sampling is performed in each stack at least monthly for a period of 5-6 hours. During the sampling period, the probe position is changed every 30 minutes. Locations of the probe position are based on ANSI 13.1-1969 recommendations; 2 to 4 positions in each duct are sampled, depending upon the duct size. Stack samples are analyzed for particulate gross alpha. Sampling for oxides of nitrogen is not routinely performed.

There are five ambient air monitoring stations located 1.2 to 1.5 m above the ground at the plant fenceline (see Figure 2-2). There is one station in each of the major compass directions and one additional station downwind of the abrasive saw stack. Monitoring stations consist of Eberline regulated flow pumps located in metal (mail box) housings. The sample is collected on a 47 mm diameter Whatman 41 filter paper, located underneath the housing to protect it from precipitation. The nominal flow rate is 35 l/m and is monitored by a Dwyer rotometer. There is a running time meter to record actual equipment operating time. Samples are operated continuously. Filters are visually inspected every few days for evidence of heavy loading; otherwise they are replaced once a week and analyzed for particulate gross alpha.

4.2 Compliance

4.2.1 Ohio Environmental Pollution Agency (OEPA) Permits to operate for all seven facility discharge sources were submitted to OEPA by RMI (Corporate Office) on March 5, 1984, and are effective until February 1987. Allowable emissions limitations for all stacks are based on particulate mass rates. Ohio EPA does not regulate NO_x emissions from sources in Priority III regions, of which Ashtabula County is one.

Findings

All stacks have been tested by an RMI consultant, Envisage Environmental Inc., in accordance with OEPA permit conditions.

- Particulate mass rate emissions, determined by Envisage, were within the permit limitations.

Recommendation - None.

4.2.2 National Emission Standard for Hazardous Air Pollutants (NESHAP) Regulations

Findings

- Calculations by ORNL, based on 1984 data and using the EPA-specified AIRDOS and DARTAB computer codes, have estimated that the maximum exposed off-site individual would receive a commited dose of 3.3 mrem, total body, and 11 mrem, critical organ. These levels indicate that doses to the public as a result of RMI operations are well below the EPA NESHAP annual limit of 25 mrem, total body, and 75 mrem, critical organ.

- Improvements in current exhaust emission controls will undoubtedly reduce off-site air concentrations.

Recommendations

Proceed with plans to implement emission control improvements on stack 4 - the major plant emission source - as soon as possible. Also, consider near future improvements on the forge booth and scrap incinerator ventilation systems. Refer to Section 4.5.

4.3 Stack Monitoring

4.3.1 Sampling Procedures

Findings

- Sampling procedures are described briefly in Section 7.2 for the Health Physics Manual (October 1982 and in greater detail in the Air Emissions Sampling Protocol (undated).

- Sampling ports for stacks 1, 2, 3, and 6 are in horizontal sections of duct and on the negative pressure side of the blower. Ports for stacks 4 and 5 are in vertical ducts on the positive pressure side of the blower.

- All sampling points are at least 5 duct diameters downstream from the last airflow disturbance. However, several of the points are within 1 to 4 duct diameter of the next downstream disturbance. As a result, according to the Health, Safety, and Security staff, the velocity profiles of these stacks are irregular. This was confirmed by review of several duct traverses, performed by the RMI consultant.

- The Kurz sampler was inspected; it was found to be in good condition and very recently (5/85) recalibrated.

- Sampling is performed according to established internal procedures and it would appear to provide samples representative of the conditions at the time of sampling.

- During the sampling period, the parameters at each probe position are not recorded. Only the final values of total time and sampled volume are recorded.

- A review of the draft 1984 Annual Environmental Monitoring Summary indicated that from 17 to 39 samples were obtained in stacks 1 through 6 (see Table 4-1). This represents monitoring for less than 5% of the total system operating time.

- RMI does not perform sampling of stack 7, which exhausts only pickling and wash tanks and has a low potential for particulate uranium emissions. Envisage Environmental Inc. sampling of this stack did indicate that total mass rate emissions were within the OEPA permit levels.

Recommendation

Because of the higher levels, greater variability, and/or chance for accidental releases, initiate continuous monitoring of stacks 4, 5, and 6. Increase the frequency of "grab" sampling in stacks 1, 2, and 3 to a minimum of weekly - continuous monitoring would be preferrable. This monitoring can be performed with relatively inexpensive commercially available probes, inline filters, and small (about 30 l/m) pumps. Single nozzle probes may be adequate, if test data indicates sampling will be representative; otherwise multinozzle probes should be used. (It should be noted that the present locations of monitoring ports in stacks 4 and 5 are such that a regular velocity profile and adequate mixing of the contaminant throughout the airstream would be anticipated.) Daily filter change is recommended, until a sufficient data base on concentration variations and filter loading can be developed.

Following improvements in ventilation systems and emission controls, all sampling ports should be relocated to straight, vertical sections of the discharge stack. Continuous sampling should then be performed on all discharges. After the levels and variation in the discharges have been characterized, sampling may be reduced to periodic grab samples for those stacks without great fluctuations in concentrations or where concentrations are considerably below levels which are required for NESHAP compliance.

TABLE 4-1

STACK SAMPLING SUMMARY

1984

Stack #	Stack Identification	# of Samples	URANIUM Highest Concen. µCi/ml	Lowest Concen. µCi/ml	Average Concen. µCi/ml
1	Extrusion Press	30	3.16×10^{-11}	2.00×10^{-13}	9.50×10^{-12}
2	Runout Table	29	3.37×10^{-11}	1.00×10^{-13}	7.70×10^{-12}
3	Cooling Table	17	4.53×10^{-11}	2.00×10^{-13}	6.90×10^{-12}
4	Abrasive Saw	24	5.51×10^{-9}	4.76×10^{-10}	1.71×10^{-9}
5	Scrap Incinerator	39	1.10×10^{-10}	1.00×10^{-13}	2.58×10^{-11}
6	Forge Booths	34	1.79×10^{-9}	8.90×10^{-12}	2.64×10^{-10}

"From Draft Annual Environmental Monitoring Summary, 1984."

4.3.2 Stack Sample Analysis

Findings

- RMI performs gross alpha analysis of air sample filters using a thin window proportional counter, Nuclear Measurements Corp, PIOPS Model ACS-82. This instrument has an efficiency of approximately 28% and an alpha background of less than 0.2 c/m. Following a 2 day radon daughter decay period, three 5 minute counts are performed on the filter and the average of these counts is used for calculation of the concentration.

- Self absorption for the Whatman 41 filter paper (per literature reference) is 30%.

- Using the counter parameters, a stack sample collection time of 5 hours, and an average flow rate of 10 l/m (typical for the RMI stacks) the detection sensitivity of the analysis based on 2σ of the counter background is 3×10^{-13} μCi/ml. This value is less than 1/10 of the applicable DOE air concentration guideline for insoluble uranium in unrestricted areas. The sensitivity for perimeter monitors would be approximately a factor of 85 lower because of the much larger sample volume.

- A confirmation of one stack sample calculation was performed and found to be accurate.

- No error factors are determined for air sampling data.

- Results of stack sampling during 1984 are summarized in Table 4-1. Average concentrations ranged from 6.90×10^{-12} μCi/ml (stack 3) to 1.71×10^{-9} μCi/ml (stack 4). Concentrations in individual samples from any specific stack varied considerably; the greatest variation was a factor of 1100 in stack 5.

- Uranium from FMPC has been shown to contain low concentrations of Pu-238 and 239, Np-237, Cs-137, Ru-106, Sr-90, and Tc-99. RMI stack releases have not been analyzed for radiological contaminants other than uranium.

- Solubility class Y has been assumed for released particulates, based on known feed material compounds and plant operation. No lung solubility determinations have been performed on residues collected from stacks or perimeter air stations.

- Envisage included particle size analysis with their stack testing for OEPA permit compliance. Fifty percent of the particulates in stack 4 were below 0.3 μm in diameter; other stacks had average particle sizes ranging up to 3 μm. There is no RMI procedure for periodic particle size determinations in stack emissions.

- The proportional counter was only very recently acquired and RMI has not yet obtained their own calibration sources or established a quality control program for the unit.

Recommendations

Calculate and report analytical uncertainties and minimum detectable activities (when appropriate) with air monitoring data.

Analyze composite annual samples for radionuclide other than uranium, which have been identified in FMPC feed materials.

Obtain an NBS traceable alpha calibration source and daily check sources for in-house use. The sources should have an effective alpha energy equivalent to natural uranium. Implement a quality control program of daily source and background checks of the instrument.

Periodically determine particle size distributions and lung solubility class for each stack. An initial frequency of annually should be sufficient. A composite of filters from several sampling periods may be required for the solubility determination to assure an adequate quantity of material for the analysis. After collection of several years of data, the results should be reviewed for trends and variability and the need for continued annual analyses evaluated.

4.4 Perimeter Air Monitoring

4.4.1 Sampling Procedures

Findings

- Perimeter air monitoring procedures are described in section 7.1 of the October 1982 Health Physics Manual. Calibration requirements are in section 9.0 of that manual.

- Inspection of three of the stations (# 2, 3, and 5) indicated that flow rates were as specified, there was no detectable in-leakage of air, and calibration tags on flow meters were up to date.

- Samples on the north fence - the down wind direction - are less than 30 m from the stack emission points. These stacks are about 12 m above the ground and although there is undoubtedly considerable downwash due to building effects, the representativeness of the samples obtained at these stations is questionable. It should be noted that the locations of these samples were not selected by modeling techniques.

Recommendation

After ventilation system upgrades have been completed, perform computer modeling to determine appropriateness of the perimeter sample locations. Based on these findings, it may be necessary to relocate samplers - some sampling may be necessary off site. On the other hand, significant reduction of stack emissions may eliminate the need for perimeter sampling.

4.4.2 Perimeter Sample Analysis

Findings

- Analytical procedures for filters from perimeter monitoring stations are identical to those for stack samples. Refer to Section 4.3.2 for discussion.

- Average concentrations measured at the perimeter sampling stations during 1984 (see Table 4-2) ranged from 8.90×10^{-15} µCi/ml to 7.06×10^{-14} µCi/ml. The highest average concentration was at station 2, on the north perimeter fence. The greatest variation between individual samples was a factor of 480 at station 3.

Recommendations - none

4.5 Emissions Control Equipment

Findings

- Stack 4 is equipped with an electrostatic precipitator (ESP). This installation was experimental and the unit has not performed according to design specifications. The poor performance of the ESP may be due in part to the presence of mists from abrasive saw cutting oils, which are present in the air stream.

- Incinerator exhausts pass through a wet scrubber and 95% particulate filters. These filters require changeout at 1-2 month intervals because of loading. RMI personnel indicate that high temperature and moisture levels are not encountered in the system. However, stack sampling filters are occassionally wet, indicating that moisture could be a concern, relative to the performance of other types of air filters such as HEPA filters.

- During 1984, the highest average concentrations were measured in stacks 4, 6, and 5 (in that order).

TABLE 4-2

PERIMETER SAMPLING SUMMARY
1984

Station #	Location	# of Samples	Uranium Highest Concen. µCi/ml	Uranium Lowest Concen. µCi/ml	Uranium Average Concen. µCi/ml
1	North Fence West	49	1.20×10^{-13}	1.00×10^{-15}	2.18×10^{-14}
2	North Fence East	49	8.20×10^{-13}	1.00×10^{-14}	7.06×10^{-14}
3	East Fence	48	4.80×10^{-13}	1.00×10^{-15}	6.73×10^{-14}
4	South Fence	49	2.00×10^{-13}	2.00×10^{-15}	1.76×10^{-14}
5	West Fence	49	3.00×10^{-14}	7.00×10^{-16}	8.90×10^{-15}

"From Draft Annual Environmental Monitoring Summary, 1984."

- Lockwood-Greene of Oak Ridge, Tennessee, has developed, under contract to DOE/OR, a conceptical design for upgrading the RMI Extrusion Plant ventilation systems. This upgrade is intended to reduce facility air emissions, while also reducing worker exposures to radionuclides and other potentially hazardous and noxious air contaminants.

- The Lockwood-Greene proposal provides for stepwise implementation of ventilation upgrades, beginning with the source of highest chronic emissions, i.e. the abrasive saw. Second priority is the forge area. Improvements to the incinerator burner exhaust has been recommended as the 5th item on the list of priorities.

- Completion of upgrades would probably require at least 1 1/2 - 2 years to complete.

- Additional studies of the workplace and emission sources are underway or planned. The results of these studies will assist Lockwood-Greene in their final design of the ventilation systems upgrades.

Recommendations

Proceed as quickly as possible with improvements to the emissions control on the abrasive saw system.

The failure of rotoclone and/or filter controls on the incinerator ventilation system could result in accidential releases of high uranium concentrations. It is suggested that the priority for upgrading emission control on this system be reevaluated, possibly placing this as item 2 or 3 on the list, rather than 5.

4.6 Meteorological Data

Findings

- The RMI Extrusion Plant does not have on site meteorological monitoring capability. Annual wind speed and direction data is obtained from Cleveland Electric Illumination (CEI), North Kingsville, Ohio. This station is located on the shore of Lake Erie; the appropriateness of using data from that location for a site 1.5 to 2 km inland is questionable.

- CEI data wind indicates prevailing surface winds from the south and south-southeast. There are no 60 meter wind or temperature data from which to determine stability conditions.

- The RMI Sodium Plant, which is about 1.5 km from the Extrusion Plant has wind data which would be available for verification of other, more remote, information.

- ORNL uses data from the Cleveland airport, 90-100 km from the RMI site, for their AIRDOS and DARTAB calculations.

- Dispersion factors being used for stack releases from RMI are based on rough calculations from the EPA Workbook of Atmospheric Dispersion Estimation. These factors do not consider effects of building disturbances, downwash, and complete site specific meteorological information.

Recommendation

Following upgrading of the exhaust emission controls, evaluate the need for an on site meteorological station. If stack emissions have been significantly reduced, emission concentrations are not highly variable, and calculations indicate population doses are well below the new NESHAPS annual criteria of 25 mrem, total body, and 75 mrem, critical organ, the necessity for an RMI station would be questionable. Should a meteorological station be desired, the advice of an organization such as ORNL should be sought.

5.0 WATER TREATMENT AND MONITORING

5.1 General System Description

Process water including water from plant floor drains is collected in a sump in the Main Plant Building. Sump contents are cycled through a 3 um diatomaceous earth filter (Sparkler Model RJ-1-108) and discharged when the sump is full - about 2.7 x 10^3 liters. Sanitary waste is treated in a Chicago Pump aerobic digestor Model S1-1-1; waste water and discharged process water, are released to a manhole located near the northeast corner of the fenced plant site, where they combine with non-contact cooling water and runoff water from property storm drains and roof drains. From the manhole the combined effluent is discharged through underground piping to the outfall at Fieldsbrook, near the extreme northeast boundary of the RMI property. Reported discharge volumes are based on water usage as indicated by the plant water meter. The average monthly usage is about 5.8 x 10^6 liters; approximately 70% of this volume is used for non-contact cooling and about 30% is process water.

Sampling is performed at the outfall using a Manning Technologies, Inc., Model S4400A2 automatic sampler. This sampler withdraws 160 milliliters from a collection basin (plastic bucket) once each hour during a 24 hour sampling period. Sampling is performed one day a week for uranium concentrations and twice a month for other potential contaminants. Sampling is not performed during periods of storm runoff to assure that contaminants measured are representative of process water from the plant. Grab outfall samples are also obtained weekly for pH and twice monthly for oils and greases. Weekly samples (8 hour composite) are collected from Fieldsbrook, upstream and downstream of the outfall, and analyzed for uranium.

5.2 Compliance

5.2.1 NPDES Permits

Fieldsbrook is the only RMI surface water outfall and is covered by a

National Pollution Discharge Elimination System (NPDES) permit OH 0000442. This NPDES permit, originally issued by Region V of the U.S. Environmental Protection Agency, is now administered by the Twinsburg Office of OEPA. Permit limits are as follows:

Characteristic	Average	Maximum
Ph	6-9	6-9
Dissolved Solids	400 mg/l	1500 mg/l
Suspended Solids	10 mg/l	25 mg/l
Oil and Grease	N/A	10 mg/l
Copper	N/A	0.5 mg/l

The permit "administratively expired" in 1978, and a new permit is being negotiated between OEPA and RMI. OEPA has proposed limitation for additional potential contaminants associated with non-ferrous forming operations, e.g. lead, chromium, cadmium; a factor 300 reduction of the current NRC uranium limit is also proposed. RMI has requested modification of some proposed limits and has challanged OEPA authority to regulate uranium releases (letter of Oct. 5, 1984 from R. J. Gerardy to OEPA).

Findings

- Because the RMI Extrusion Plant is not wholly DOE-owned and DOE only partially funds plant operations, the NPDES permit is held by RMI company, rather than DOE, as is the case with most prime contractors. Under provisions of the RMI/DOE contract, DOE acts only as a regulatory authority with respect to potential radiological impacts from processing of DOE materials. RMI submits monthly reports directly to the OEPA with copies to DOE/OR for information.

- Very few exceedances of NPDES limits occur. During 1984 only 3 samples contained levels above permit limits; the contaminants exceeding limits were "total suspended solids", "oil and grease", and "copper" (see Table 5-1).

TABLE 5-1

NPDES PERMIT SUMMARY

1984

Parameter	# of Samples	Highest Concen.	Lowest Concen.	Average Concen.	Permit Limit	Compliance With Permit Limits %
pH (S.U.)	51	8.3	7.1	7.8	6-9	100
Dissolved Solids (mg/L)	25	469	229	307.2	400 avg.	100
Suspended Solids (mg/L)	25	27.5	2.0	7.2	10 avg.	96
Oil & Grease (mg/L)	25	39.0	1.0	3.6	10	96
Copper (mg/L)	25	.51	.03	.11	0.5	96

"From Draft Annual Environmental Monitoring Summary, 1984."

- Exceedances have all been less than 1.4 times the permit limit and are therefore considered insignificant by OEPA; no notices of violations have been issued.

- Reports of exceedances are provided to OEPA, but not always within the prescribed 5 day reporting period requirement. Copies of exceedance reports are not provided to DOE/OR, because that office does not maintain regulatory authority for those parameters.

- RMI appears to have established a good working relationship with regulatory agencies.

- In 1981 the plant effluent was screened for priority pollutants; no significant levels were identified.

- Activities are in progress to upgrade the process water and sewage treatment facilities (refer to Section 5.4 of this report). It is anticipated that these improvements will result in a decreased frequency of discharge violations.

Recommendation - none

5.2.2 Spill Prevention Control and Countermeasure (SPCC) Plan

Findings

- The RMI Extrusion Plant has prepared and submitted a SPCC plan to OEPA. Because of changes at the RMI site this plan is out of date.

- Battelle Memorial Institute of Columbus, Ohio, is currently updating the SPCC plan as part of an overall upgrading of RMI waste management practices. This update is expected to be completed by late 1985.

- The Health, Safety and Security section has instructed all supervisory and plant floor personnel in reporting spills of hazardous material. All spills, regardless of magnitude, are expected to be reported. Thus far no incidents have occurred which require notification of regulatory agencies.

- Materials for control and countermeasure in the event of spills is maintained at critical locations throughout the plant. A spot check of one such location indicated that these materials are on hand.

Recommendation - none

5.3 Monitoring

5.3.1 Sampling Procedures

Findings

- Protocol and procedure for sampling liquid effluent discharges are documented in several locations. These include the Health Physics Manual, Section 7.3, (October 1982); Environmental Affairs Manual, Section V, (undated); and a one page description of sampler operation, (undated). The information contained in these documents is brief and provides insufficient details regarding sampler operation and sample handling.

- Although the sampling system satisfies the current NPDES permit requirements, the proposed NPDES permit requires that samples be "representative of the volume and nature of the monitored flow". OEPA interpretation of this requirement may indicate a need for proportional sampling.

- Sampling is performed only during periods of no storm runoff. This may result in underestimating or overestimating the average uranium concentrations in the effluent, depending upon the amount of uranium "washed" from contaminated ground, equipment, and building surfaces by storm runoff.

- The sample is not maintained cooled; however, the NPDES permit parameters do not require cooling (no BOD or fecal coliform limit).

- There are no procedures requiring periodic calibration of the sampler collection volume.

Recommendations

Prepare and formalize (date and sign) detailed procedures for sampling the liquid effluent stream.

Reevaluate the present sampler relative to proposed NPDES requirements. Also obtain samples during periods of storm runoff to determine effect of runoff on uranium concentrations. Based on these results determine whether installation of a weir or other system which will enable proportional sampling is necessary.

Develop and implement a procedure for routine volume calibration of the sampler.

5.3.2 Analytical Procedures

Findings

- RMI performs in-house analyses for pH, dissolved solids, and suspended solids. Other non-radiological analyses are performed by outside commercial labs. Analyses are by generally accepted or prescribed methods - <u>Standard Methods for the Examination of Water and Waste Waster, 15th Edition</u> and <u>Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020.</u>

- Samples for uranium analysis are adjusted to a pH of <2 with nitric acid and sent to U.S. Testing Laboratory in Richland, Washington. Analysis is for soluble uranium only, using the fluorometric method.

- Detailed procedures describing sample handling and preparation have not been developed.

- Uranium from the FMPC has been shown to contain low concentrations of Pu-238 and 239, Np-237, Cs-137, Ru-106, Sr-90, and Tc-99. RMI waste water samples, however, have not been analyzed for radiological contaminants other than uranium.

- The RMI in-house laboratory maintains a quality assurance program of detailed documented procedures, calibration records, and quality control charts. There is essentially no documented quality assurance program in effect for Health, Safety, and Security activities. Samples distributed for outside analysis are not accompanied by blanks, spikes, and duplicates to evaluate vendor laboratory performance.

Recommendations

Develop and implement a quality assurance program for environmental monitoring activities. This program should include submitting known concentration samples to vendor labs for performance monitoring.

Prepare and analyze an annual composite sample for radionuclides other than uranium, which have been identified as present in the material from FMPC.

5.3.3 Monitoring Results

Findings

- NPDES permit parameters have been exceeded infrequently in individual semi-monthly samples (see Section 5.2.1); on an annual average basis, these parameters are well within the permit limitation concentrations (see Table 5-1) and no major deficiencies or violations have been identified by OEPA.

- The average uranium concentration during 1984 was 2.14×10^{-6} µCi/ml. The samples from downstream in Fieldsbrook indicated the average concentration was reduced to 2.02×10^{-8} µCi/ml by dilution. Refer to Table 5-2.

TABLE 5-2

WASTEWATER MONITORING SUMMARY
1984

Sample Location	# of Samples	URANIUM Highest Concen. µCi/ml	Lowest Concen. µCi/ml	Average Concen. µCi/ml
Plant Outfall	52	1.39×10^{-5}	2.14×10^{-8}	2.14×10^{-6}
Fieldsbrook Upstream	19	2.62×10^{-8}	1.05×10^{-10}	3.94×10^{-9}
Fieldsbrook Downstream	19	8.00×10^{-8}	2.70×10^{-9}	2.02×10^{-8}

"From Draft Annual Environmental Monitoring Summary, 1984."

- OEPA has proposed adding uranium to the NPDES permit at a level below the DOE guideline. This proposal is being contested by RMI.

- Plans are in progress to install an additional system for removal of uranium from process water (refer to Section 5.4).

Recommendations - none

5.4 Pollution Control Equipment

Findings

- Replacement of the present sewage treatment plant with a modular treatment facility, having increased performance capabilites, is planned for the summer of 1985.

- Proposals for a process-water treatment operation, to be installed between the sump and the diatomaceous earth filter, have been solicited. Installation of a system, which would reduce uranium levels by at least a factor of 20, is anticipated to be completed by February 1986; funding permitting.

- The integrity of effluent collection points and transport lines within the plant site is unknown. Leakage of those lines and sumps which might contain untreated wastes could result in ground water contamination.

Recommendation

Test main piping and sumps for leakage.

6.0 SOIL, SEDIMENT, AND VEGETATION MONITORING

6.1 Soil Sampling Procedures

Findings

- Section VII of the "Environmental Affairs Manual" presents an abbreviated soil monitoring protocol for on- and off-site monitoring. This protocal does not provide guidance as to the selection of sampling locations, time of year for sampling, amount of sample to be collected, detailed sampling procedures, special precautions to avoid cross contamination, or sample handling and packaging requirements.

- The RMI staff is not familiar with standard EPA or ASTM soil sampling methodologies.

- Samples are collected using a 5.1 cm (2 inch) diameter "cookie cutter" sampling tool. Samples are to a depth of 5 cm; no core sampling has been performed to determine vertical soil profiles.

- During 1984, 26 off-site samples were collected, these samples were from along public roads out to a distance of 2.4 km (1 1/2 miles). Samples were obtained at the four main compass point directions from the site.

- Thirty-two on-site samples were collected in 1984.

- Five "special" off-site samples were collected in 1984 from the property immediately north of the RMI plant perimeter fence.

- Annual samples are not collected from the same locations; therefore, trends cannot be evaluated.

- Exact sample locations are not recorded. There is no documentation describing the physical appearance or conditions of the sample location or the soil sample itself.

Recommendations

Develop detailed procedures for soil sampling. Procedures should include provision for core sampling, and present methodologies for selection of sampling locations. Sampling protocols should include periodic resampling of areas to enable evaluation of trends.

6.2 Soil Data

Findings

- Analysis of soil samples is performed by U.S. Testing Laboratory in Richland, Washington. Results are recorded on sample forms provided by RMI with the samples. Units are milligrams of U per gram of soil (mg/g); RMI converts these values to pCi/g. No error values are reported; detection sensitivities are not known by RMI. Also the reports are not signed and dated by the vendor lab.

- Several conversion calculations were verified for October 5, 1984 data and it was determined that the pCi/g value being reported by RMI is for all uranium isotopes.

- RMI does not submit blanks, spikes, or duplicates to U.S. Testing for performance evaluation.

- Results of the 1984 soil sampling, per the Draft RMI Annual Environmental Monitoring Summary indicate off-site uranium soil concentrations ranging from 0.21 to 6.62 pCi/g. These levels are lower than the off-site soil concentrations reported for the previous two years.

- On-site soil samples during 1984 contained 1.28 to 2,439 pCi/g of uranium. Highest levels were in the vicinity of the former open incinerator facility. This area is also near a storm drain.

- Concentrations of uranium in five soil samples from north of the plant perimeter fence ranged for 47 to 130 pCi/g. This contamination is believed due to a combination of storm water runoff (see Section 7) and ventilation system discharge.

- Sample results are being compared to the NRC guideline values of 35 pCi/g for depleted uranium and 30 pCi/g for enriched uranium in unrestricted areas.

Recommendations

Obtain and keep on file a copy of the current analytical procedure used by U.S. Testing along with the lab's detection sensitivity levels and information describing their QA/QC program. Require that data supplied by vendor laboratories be signed and dated and that error values be provided.

Implement a QA program for monitoring analytical services of outside laboratories.

Analyze an annual composite or selected individual annual samples for other radionuclides, which have been identified in uranium from FMPC.

Perform or have performed, a thorough, statistically designed survey of off-site soil contamination to determine the extent of radionuclide contamination in the environment, which might be attributable to RMI operations.

Evaluate on-site soil contamination data to identify possible runoff areas. Take steps to reduce the potential for runoff by removal of contaminated soil and control of surface runoff routes. Also check roof surfaces for possible sources of uranium runoff.

The NRC uranium soil guidelines presented in their Branch Technical Position Paper are based on pCi/g of total uranium, i.e. the sum of U-238, U-234, and U-235.

Care should be exercised in making comparisons with the NRC guideline values until DOE has made a policy decision that such guidelines are appropriate. The reason for this is that other cleanup guidelines currently in use by DOE (e.g. the Formerly Utilized Site Remedial Action Program) are considerably higher than the NRC levels. For example, FUSRAP uses a level of 150 pCi/g for total uranium in soil.

6.3 Sediment Sampling Procedures

Findings

- There are no documented RMI procedures for sediment sampling and handling; the RMI staff is not familiar with procedures used by other organizations or recommended by environmental regulatory agencies.

- Samples are collected annually from Fieldsbrook at the liquid effluent outfall and approximately 75 m (250 ft.) downstream and 60 m (200 ft.) upstream of the outfall.

- Samples are obtained at bends in the stream, where there are more likely to be accumulations of sediment. The exact sampling locations are not identifed and sampling therefore cannot be repeated to evaluate trends.

- Samples are collected by scooping up bottom material to a depth of about 5.1 cm (2 inches) using a garden trowel; no precautions are observed to prevent loss of very fine particulates or surface cave-in around the sampling point. Also, no core samples are obtained for profile determination.

Recommendations

Develop detailed procedures for sediment sampling. Procedures should include provisions for periodic core sampling and should present methodologies for selection of sampling locations. Sampling protocols should include periodic resampling of areas to enable evaluation of trends.

An increase in the number of downstream sampling points to at least five is recommended.

6.4 Sediment Data

Findings

- Analysis of sediment samples is performed by U.S. Testing Laboratory is Richland, Washington. Results are recorded on sample forms provided by RMI with the samples. Units are milligrams of U per gram of sediment (mg/g); RMI converts these values to pCi/g. No error values are reported; detection sensitivities are not known by RMI. Also the reports are not signed and dated by the vendor lab. It is not known whether the results are relative to dry weight.

- RMI does not submit blanks, spikes, or duplicates to U.S. Testing for performance evaluation.

- Results of the 1984 sampling, per the Draft RMI Annual Environmental Monitoring Summary, indicate 54.9 pCi/g at the outfall, 10.2 pCi/g downstream and 1.0 pCi/g upstream.

Recommendations

Obtain and keep on file a copy of the current analytical procedure used by U.S. Testing along with the lab's detection sensitivity levels and information describing their QA/QC program. Require that data supplied by the vendor laboratories be signed and dated and that error values be provided.

Implement a QA program for monitoring analytical services of outside laboratories. Analyze an annual composite or selected individual annual samples for other radionuclides which have been identified in uranium from FMPC.

6.5 Vegetation Sampling Procedures

Findings

- There are no documented RMI procedures for vegetation sampling and handling; the RMI staff is not familiar with procedures used by other organizations or recommended by environmental regulatory agencies.

- Samples of surface vegetation have been collected in the past (per 1982 and 1983 Annual Environmental Monitoring Summary) at locations of soil sampling. However, the Health, Safety, and Security section has recognized deficiencies in the sampling program (e.g. the very small quantity of vegetation collected for analysis) and is therefore reevaluating this program.

Recommendations

Develop detailed procedures for vegetation sampling and sample handling. Procedures should present methodologies for selection of sample type and locations. Sampling protocols should include periodic resampling of areas to enable evaluation of trends.

6.6 Vegetation Data

Findings

- Analysis of vegetation samples has been performed by U.S. Testing Laboratory in Richland, Washington. Results are recorded on sample forms provided by RMI with the samples. Units are milligrams of U/g per gram of vegetation (mg/g); RMI converts these values to pCi/g. No error values are reported; detection sensitivities are not known by RMI. Also the reports are not signed and dated by the vendor lab. It is not known whether the results are relative to wet, dry, or ashed weight.

° RMI does not submit blanks, spikes or duplicates to U.S. Testing for performance evaluation.

Recommendations

Obtain and keep on file a copy of the current analytical procedure used by U.S Testing along with the lab's detection sensitivity levels and information describing their QA/QC program. Require that data supplied by the vendor laboratories be signed and dated and that error values be provided.

Implement a QA program for monitoring analytical services of outside laboratories.

Analyze an annual composite or selected individual annual samples for other radionuclides which have been identifed in uranium from FMPC.

7.0 WASTE MANAGEMENT

7.1 General Description of Waste Management Activities

Solid wastes generated at the RMI Extrusion Plant are general scrap and refuse, non-hazardous industrial waste, sewage treatment facility sludge, low-level radioactive waste, and RCRA hazardous wastes (also containing low-level uranium contamination). RMI has developed a "Waste Classification and Analysis Plan", revised 2/.7/85, which describes procedures for determining the proper classification of "solid" wastes generated at the plant. General scrap and refuse is segregated from other waste, based on the area (and operation) of generation within the plant. This waste is collected in dumpsters located throughout the facility. Dumpsters are locked to prevent the use for disposal of unauthorized waste; foremen control access to the dumpsters. Dumpsters are usually spot checked for potentially contaminated materials, before disposal at the local landfill.

Non-hazardous industrial wastes are of very limited quantity; they have included used oils, which are sold to recyclers.

Sewage treatment sludge is transferred to a collection group, A-All Ashtabula Sewer and Septic Tank Cleaning. This group delivers the sludge to the local waste water treatment plant. Low level contaminated wastes are recycled to FMPC for disposal or recovery of uranium.

Hazardous wastes are primarily barium chloride (about 9 tons/yr) from the salt baths and sludge from the nitric acid pickling baths (about 42 tons/yr). Other wastes include waste solvents (perchloroethylene and methylene chloride about 400 liters/yr) and contaminated pump oil and lathe coolant. These wastes are stored in 208 liter metal drums until they can be disposed of. There are no on site facilities for treatment of hazardous or mixed radioactive waste.

The only known on-site disposal area at RMI was a small pond previously used for disposal of neutralized nitric acid from pickling baths. This pond (see Figure 2-2) was excavated and refilled in mid-1984. Uranium contaminated sludge and soil from excavation of the pond is stored on site awaiting disposal.

7.2 Monitoring Wastes for Radioactivity Levels

Findings

- The Waste Classification and Analysis Plan, Section III-A, specifies non-radioactive wastes as those containing a de-minimus concentration of uranium. The "de-minimis" level indicated in this section is 50 mg/l for natural or depleted uranium; all waste containing enriched uranium, regardless of the concentration, is to be treated as radioactive waste. A level of 50 mg/l is equivalent to 16,600 pCi/l or 1.66×10^{-5} μCi/ml of U-238. This is greater than the DOE guideline of 1×10^{-6} μCi/ml for uranium 238 in water in unrestricted areas. It should be noted that 50 mg of natural (processed) uranium will contain a total alpha activity level of almost 35,000 dpm.

- The Waste Classification and Analysis Plan does not provide guidance as to allowable surface contamination levels or allowable levels of uranium in solid wastes, whose quantity is not measureable in liters.

- The sanitary sewage treatment facility sludge is not monitored for uranium content prior to transfer to the disposal firm.

Recommendations

Reevaluate the uranium levels specified in the classification plan for identifying waste as radioactive. Although the NRC licensable concentration for natural uranium is 0.05% or 500 mg/l, release at this concentration could exceed environmental control limits. The "de-minimis" classification criteria should likely be reduced. Also levels relative to other types of waste should be included on this plan.

Initiate a program to analyze sewage sludge for radioactive concentrations, including an annual composite analysis for other potential radionuclide contaminants.

7.3 RCRA Compliance

Findings

- RMI has filed notification with OEPA as a generator and storage facility. Battelle is currently preparing the Part B permit

Recommendation

Dispose of accumulated waste. If the disposal of this waste cannot be accomplished in the immediate future it is recommended that the contaminated wastes be covered and/or temporary berms be constructed to prevent runoff of surface uranium contamination.

8.0 QUALITY ASSURANCE PROGRAM

Findings

- RMI has a Plant Quality Assurance (QA) document, RMI-L-72, last revised in Decmber 1975. This document does not, however, provide in depth consideration for matters related to health, safety, and environmental protection.

- The QA Supervisor is also responsible for supervising laboratory activities; the laboratory responsibility takes precedent over QA.

- The QA Supervisor does not report directly to upper management.

- There is no program of internal QA audits; also DOE/ORO has not performed a recent (within the last 6 years) appraisal of the RMI QA program.

- The RMI Laboratory maintains an auditable program of equipment calibration and quality control. Detailed maintenance records are not maintained for laboratory equipment.

- The Health, Safety, and Security section does not have detailed procurement, operating, calibration, and quality control procedures for in-house activities or relative to vendor services.

Recommendations

Reassign the QA Supervisor responsibility to an individual with formal reporting lines to upper management.

Provide QA training to the QA Supervisor and other management level personnel.

Review the QA program relative to the requirements of DOE Order 5700.6.

Implement a program of internal audits to identify and prioritize areas of QA deficiencies.

9.0 MISCELLANEOUS

9.1 Data Handling

Findings

- Calculations confirmed during the review did not identify errors or questionable values.
- Records observed were legible, signed, and dated. Some were in pencil, whereas pen is preferrable.
- Computerization of environmental monitoring data has just recently begun. The Health, Safety, and Security section is sharing access to an IBM-PC-XT with a 20 meg hard disk. Software includes Symphony, dBase III, and a statistical and QA package called Statgraphics.
- ORNL performs annual off-site dose calculations based on emissions, monitoring, and other support data provided by RMI. The calculation for 1984 indicates a low dose commitment of only 3.3 mrem total body and 11 mrem critical organ to the maximally exposed individual.

Recommendation - none

9.2 Contamination Monitoring of Materials Leaving the Plant

Findings

- Non-hazardous wastes leaving the plant are not monitored to assure that contaminated materials are not included with the waste.
- Non-uranium products for the commercial sector are spot monitored, but there are no standard procedures and results are not documented. A walk-through of the plant area and warehouse

identified conditions and operations, which have a potential for contaminating commercial product with uranium.

Recommendation

Implement procedures for routine contamination monitoring of non-uranium products leaving the RMI Extrusion Plant.

9.3 Emergency Preparedness

Findings

- RMI has a documented Emergency Procedures Manual, RMI-L-51; review of the plant emergency preparedness status is included in the plant waste management upgrade, currently being performed by Battelle.

- Hypothetical accidents considered in the preparation of the emergency plan include fire and nitric acid tank release. Both of these accidents could impact the off-site environment, depending upon circumstances.

- RMI has limited portable monitoring capability, consisting of small battery operated and 110 volt pumps and a portable electric generator. Monitoring would be limited to air particulate contamination.

- RMI corporation has agreements with the Ohio Disaster Services Agency (Columbus, Ohio) for off-site monitoring in emergencies. However, representatives of this agency have not toured the Extrusion Plant site.

- Local fire and medical response groups have been on site for minor incidents and have received limited briefings by Health, Safety, and Security.

- Because of the nearby Perry Nuclear Plant a comprehensive emergency response plan exists for the Ashtabula County area.

Recommendation - none

9.4 Groundwater Monitoring

Findings

- RMI presently performs no monitoring of groundwater for possible contaminants from the Extrusion Plant operations.

- Core samples following removal of the nitric acid neutralization pond indicated residual uranium contamination in the soil of up to 1270 pCi/g of all isotopes of uranium.

- The water table at the plant site is relative shallow, typically ranging between 1.5 and 4.5 meters.

- Dames and Moore is conducting a study involving the installation of six shallow wells, to characterize the hydrology and provide preliminary indication of any groundwater contamination problem. Analyses will initially include uranium, nitrates, chlorides, and total organics.

Recommendation

Based on the results of the Dames and Moore study, determine if a groundwater monitoring program is needed at RMI. If so, involve Dames and Moore in the design of such a program. The program should be documented and include details related to sampling frequency and procedures, contaminants to be monitored, and sample handling and analytical procedures.

APPENDIX A

BIOGRAPHICAL SKETCH OF REVIEWER

BIOGRAPHICAL SKETCH

James D. Berger
Oak Ridge Associated Universities
Oak Ridge, Tennessee

Manager, Radiological Site Assessment Program at ORAU from 1980 to present. Main duties include technical assistance to DOE and NRC in areas of radiological environmental surveys and evaluation of effluent and environmental monitoring programs. Prior positions at ORAU include Department Head, Health and Safety Office, 1975 to 1980; Radiation and Chemical Safety Officer, 1970 to 1975; and health physicist, 1967 to 1970. Also, Health Physics Team Leader for the ORAU Radiation Emergency Assistance Center since 1975. Additional professional experience as industrial hygienist at Bettis Atomic Power Laboratory, 1963 to 1966, and instrument development physicist with the Bureau of Radiological Health, 1960 to 1963.

Education

B.S. in Physics from Bowling Green State University, 1960.
M.S. in Radiological Health from Northwestern University, 1968.

Professional Society Affiliations

Health Physics Society
American Industrial Hygiene Association

Certified by American Board of Health Physics

Publications

Author or co-author of approximately 10 published reports, guidebooks, and book chapters in various areas of health physics.

Author of numerous unpublished (internal use only) reports describing findings or results of technical assistance for DOE and NRC.

APPENDIX B

SCOPE OF WORK
ENVIRONMENTAL PROGRAM REVIEW
RMI COMPANY

SCOPE OF WORK

ENVIRONMENTAL PROGRAM REVIEW

RMI COMPANY

I. Effluent and Environmental Monitoring

Conduct a comprehensive technical review of the effluent and environmental monitoring programs for radioactive and nonradioactive effluents to air, water, and land. Evaluation of control equipment should be made only to the extent that the effluent and environmental monitoring review indicates a problem (control equipment which may cause a problem should be noted). Determine the degree of compliance with applicable DOE Orders, Federal and State laws and regulations, and "good professional practice" for all aspects of the environmental management program. Provide written findings as well as recommendations for any needed improvements on a periodic basis (frequency to be determined by DOE once the review plan is organized by the contractor) to the Environmental Protection Branch.

Areas to be addressed include, but should not be limited to, the following for each of the three medias (i.e., air, water, land):

A. Sampling

1. Locations (representativeness)
2. Frequency
3. Methodology
4. Parameters
5. Equipment utilized

B. Analyses

1. Data analysis and statistical treatment
2. Equipment

C. Results

1. Calculational methods and computer programs
2. Data reduction
3. Interpretation
4. Trend analysis

D. Quality Assurance, Quality Control, Reliability, and Maintainability

1. Verify inclusion in an overall contractor quality assurance program. Assess the adequacy of the quality assurance elements being used.

2. Assess the reliability of the existing systems. Review failure rates. Examine the need for redundancy and backup.

3. Assess the use or feasibility of statistical methods to demonstrate that measurement systems are in a state of control relative to design standards.

4. Affirm that activities affecting quality including procurement, receiving, storing, installing, maintenance, testing, repairing, modifying and operating contribute to satisfactory performance in service.

5. Verify the measurement accuracy of all systems that are used for the purpose of quantifying releases.

6. Examine random and systematic error estimates.

E. Policy and Procedures

1. Training
2. Knowledge of regulatory requirements

F. Records and Reporting

The components of the environmental monitoring review should include, but not be limited to, the following:

A. Soil and vegetation sampling (radionuclides and chemical releases)

B. Sediment sampling

C. Air monitoring and modeling

1. Source characterization studies

D. Surface and Groundwater monitoring/sampling

E. Radiation dose and contaminant level estimates

F. Continuous monitoring for emergency detection

G. Landfill operations

For the above, assurance is needed on the appropriateness of the monitoring locations, frequencies, methodology, equipment, procedures, data reduction, interpretation, trend analyses, quality assurance, quality control, reliability, records, and reporting.

II. Coordination

The effort will involve coordination with the following organizations:

A. RMI Company

B. State of Ohio

C. Environmental Protection Division, DOE-HQ

D. Defense Programs, DOE-HQ and DOE-ORO

E. Environmental Protection Branch, DOE-ORO (Vincent Fayne - Contact)

Initiate as soon as possible after March 11,1985.
Project to be concluded by May 1,1985.

III. Products

A. Periodic summary reports with recommendations

B. Detailed Report with overall program recommendations

IV. Manpower Requirements

A. 100 - 150 man-hours

B. Personnel to be selected by consultant

APPENDIX C

LIST OF DOCUMENTS REVIEWED

APPENDIX C

LIST OF DOCUMENTS REVIEWED

Environmental Affairs Manual

Health Physics Manual

Annual Environmental Monitoring Summary for RMI Company, 1982

Annual Environmental Monitoring Summary for RMI Company, 1983

Annual Environmental Monitoring Summary for RMI Company, 1984 (Draft)

Waste Classification and Analysis Plan

DOE Hazardous Chemical Waste Site Visit Report

OEPA Permit to Operate an Air Contaminant Source (permits for 7 stacks)

RMI Extrusion Plant Vulnerabilities and Risk Assessment, March/April 1985 (Draft)

Envisage Environmental Inc., emmissions testing reports

Air Emission Sampling Protocol

NPDES Extrusion Plant, March 15, 1974

OEPA Permit No 31C00023*CD (Draft)

Research Proposal by Battelle for Assistance in Development of RCRA, Part B Application and Hazardous/Radioactive Mixed Waste Management Plan, March 15, 1985

Spill Prevention Control and Countermeasure Plan, Part 1

RMI Request for Quotation on Process Wastewater Treatment System, 4/19/85

NPDES Exceedance Reports to OEPA: October 2, 1984, November 14, 1984, April 15, 1985

Letter - F. Van Loocke (RMI) to T. Oakes (ORNL) "AIRDOS Analysis of 1984 Stack Discharge - RMI Company", February 5, 1985

Letter - W. Hibbitts (DOE/OR) to D. Sreniawski (NRC-Region III) "Revised Ashtabula Extrusion Plant Uranium Release Report", April 16, 1985

Letter - M. Theisen (DOE) to B. Davis (DOE), "RMI RCRA Permit: Request for Review", October 31, 1984

Letter - R. Gerardy (RMI) to OEPA, "Response to Public Notice re NPDES Permit Renewal 31C00023*CD", October 5, 1984

Miscellaneous - RMI Laboratory data forms for air samples

U.S. Testing Laboratory Counting Data Sheets, Soil and Vegetation (10-5-84 samples), Core Samples (8-1-84), Water (4-16-85)

APPENDIX D

SUGGESTED REFERENCES ON ENVIRONMENTAL AND EFFLUENT MONITORING

FEDERAL REGULATIONS

DOE Orders

5480.1A	Environmental Protection Safety and Health Protection Program.
5480.2	Hazardous and Radioactive Mixed Waste Management.
5482.1	Environmental Protection, Safety, and Health Protection Appraisal Program.
5484.1	Environmental Protection, Safety, and Health' Protection Information Reporting Requirements.
5700.6A	Quality Assurance.

Nuclear Regulatory Commission

10 CFR 20	Standards for Protection against Radiation.
10 CFR 51	Environmental Protection Regulation for Domestic Licensing and Related Regulatory Function.

EPA

40 CFR 50	National Primary and Secondary Ambient Air Quality Standards.
40 CFR 51	Requirements for Preparation, Adoption, and Submittal of Implementation Plans.
40 CFR 52	Approval and Promulgation of Implementing Plans.
40 CFR 60	Standards of Performance for New Stationary Sources.
40 CFR 61	National Emission Standards for Hazardous Air Pollutants.
40 CFR 122	EPA Administered Permit Program: The National Pollutant Discharge Elimination System; The Hazardous Waste Permit Program; and The Underground Control Program.
40 CFR 125	Criteria and Standards for the National Pollutant Discharge Elimination System.
40 CFR 129	Toxic Pollutant Effluent Standards.
40 CFR 133	Secondary Treatment Information.
40 CFR 141	National Interim Primary Drinking Water Regulations.
40 CFR 260	Hazardous Waste Management System: General.

40 CFR 261 Identification and Listing of Hazardous Waste.

40 CFR 262 Standards Applicable to Generators of Hazardous Waste.

40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

MISCELLANEOUS REFERENCES

NRC Regulatory Guides

1.113 Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I.

4.5 Measurements of Radionuclides in the Environment-Sampling and Analysis of Plutonium in Soil.

4.6 Measurements of Radionuclides in the Environment-Strontium-89 and Strontium-90 Analyses.

4.11 Terrestrial Environmental Studies for Nuclear Power Stations.

4.14 Radiological Effluent and Environmental Monitoring at Uranium Mills.

4.15 Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Stream and the Environment.

4.16 Measuring, Evaluating, and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Airborne Effluents from Nuclear Fuel Reprocessing and Fabrication Plants.

OTHER

General

DOE/EP-0023 A Guide for Environmental Radiological Surveillance at U.S.Department of Energy Installations, 1981.

DOE/EP-0096 A Guide for Effluent Radiological Measurements at DOE Installations, 1983.

IAEA-SS-41 Objectives and Design of Environmental Monitoring Programs for Radioactive Contaminants, 1975.

NUREG/CR-3332 Radiological Assessment, 1983.

ASTM STP 693 Effluent and Environmental Radiation Surveillance, 1980.

HASL-300 ED.25	EML Procedures Manual, 1982.
ORP/SID 72-2	Environmental Radioactivity Surveillance Guide, EPA.
NCRP-50	Environmental Radiation Measurements, 1976.
ICRP-43	Principles of Monitoring for the Radiation Protection of Population, 1984.
	Handbook of Environmental Radiation, A. W. Klement, CRC Press, 1982.
	Instrumentation for Environmental Monitoring, R. J. Budnitz, A. V. Nero, D. J. Murphy, R. Graven, Wiley-Interscience, 1983.

Air

ANSI N 13.1-1969	Guide to Sampling Airborne Radioactive Material in Nuclear Facilities.
ANSI N 13.10-1974	Specifications and Performance of on-site Instrumentation for Continuously Monitoring Radioactivity in Effluents.

Water

GJ/TMC-08	Procedures for the collection and Preservation of Groundwater and Surface Water Samples and for the Installation of Monitoring Wells, (see FJ/TMC-15).
	National HandbookMethods for Water Data Acquisition, USGS, Acquistion, USGS, Restion, VA.

Soil and Sediment

	Sampling of Soils for Radioactivity: Philosophy, Experience, and Results, Fowler et al, ERDA Symposium Series 38, CONF-74092, 1974.
ASTM 019.07	Proposed Practice for Sampling Fluvial Sediments in Motion.
	Field Manual for Stream Sediment Reconnaissance - Savannah River Lab, R. B. Ferguslon et al, U.S. DOE Report GJBX-30(77).
	Field Manual for the Hydrogeochemical and Stream Sediment Reconnaissance as used by the Los Alamos Scientific Laboratory, R. R. Sharp et al, U.S. DOE Report FJBX-60(80).
	Hydrogeochemical and Stream Sediment Procedures of the Uranium Resource Evaluation Project; Oak Ridge Gaseous Diffusion Plant Arendt et al, U.S. DOE Report GJBX-32(80).

GJ/TMC-13	Procedures for Sampling Radium - Contaminated Soils, DOE Division of Remedial Action Projects, Technical Measurements Center, Bendix Field Engineering Corp., Grand Junction, CO.
GJ/TMC-14	Procedures for Reconnaissance Stream - Sediment Sampling, DOE Division of Remedial Action Projects, Technical Measurements Center, Bendix Field Engineering Corp., Grand Junction, CO.

Laboratory

EPA-600/777-088	Handbook for Analytical Quality Control in Radio-analytical Laboratories.
EPA/CE 91-1	Procedure for Handling and Chemical Analysis of Sediment and Water Samples, 1981.
EPA 520/1-80-012	Upgrading Environmental Radiation Data, 1980.
NQA-1	Quality Assurance Program Requirements for Nuclear Facilities, ANSI/ASME.

RMI TITANIUM

RMI Company

EXTRUSION PLANT

P. O. BOX 579
ASHTABULA, OHIO 44004
216/997-5141 TWX 810-427-2926

RECEIVED
JAN 10 1986
OHIO EPA-N.E.D.O

January 8, 1986

Ohio Environmental Protection Agency
Northeast District Office
2110 East Aurora Road
Twinsburg, Ohio 44087

Subject: NPDES Exceedance Report for Permit #OH0000442

Gentlemen:

On December 4 and 18, 1985 routine 24 hour composite samples were taken from the RMI Company Extrusion Plant effluent. These samples were analyzed on December 6 and 20, respectively for total non-filterable residue (T-NFR), total dissolved solids (TDS) and total copper. The results were 17.0 mg/l T-NFR (Dec. 6), 3159.0 mg/l TDS (Dec. 18) and 750 mg/l total copper (Dec. 18). These results exceed the permit limits for the effluent characteristics.

We believe the sources of the pollutants have been identified. The December 6 exceedance for T-NFR appeared to have been a momentary malfunction of our sanitary sewage treatment plant. The December 20 TDS exceedance was a result of roadway de-icing salt (calcium chloride) being washed into plant storm drains during a thawing period. The total copper exceedance of December 20 apparently was a human error in the operation of process equipment. All parameters and processes will be closely monitored to further insure future compliance.

Very truly yours,

RMI COMPANY

R. D. Heiser
Plant Manager

RDH/MRS/cws

65

RECEIVED

JAN 1 0 1986

SOLID WASTE BRANCH
U.S. EPA, REGION V

RCRA Part B Permit Application

for:

RMI Company Extrusion Plant
East 21st Street
Ashtabula, Ohio

OHD980683544

December, 1985

BATTELLE
Columbus Division
505 King Avenue
Columbus, Ohio 43201

COPY 1

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CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: [signature] for E. D. Heuser

Title: PLANT MANAGER

Date: JAN. 6, 1986

A PART A PERMIT APPLICATION

PART A PERMIT APPLICATION - ORIGINAL

Please print or type in the unshaded areas only (fill-in areas are spaced for elite type, i.e., 12 characters/inch)

Form Approved OMB No. 158 R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F OHD980683544 D

LABEL ITEMS

I. I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill—in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill—in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		X		B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X	
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	X			D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X			F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X		J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP RMI COMPANY EXTRUSION PLANT

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 FRANK VAN LOOCKE	

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 P.O. BOX 579

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 ASHTABULA	OH	44004

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

EAST 21ST STREET

B. COUNTY NAME

ASHTABULA

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
6 ASHTABULA	OH	44004	

EPA Form 3510-1 (6-80)

CONTINUE ON REVERSE

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. SIC CODES (4-digit, in order of priority)

A. FIRST		B. SECOND	
3356	(specify) Extruding Nonferrous Metals	7	(specify)

C. THIRD		D. FOURTH	
3351	(specify) Extruding Copper	7	(specify)

I. OPERATOR INFORMATION

A. NAME

RMI COMPANY

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

P (specify)

D. PHONE (area code & no.)

A 216 652 9951

E. STREET OR P.O. BOX

000 WARREN AVENUE

F. CITY OR TOWN	G. STATE	H. ZIP CODE
NILES	OH	44446

IX. INDIAN LAND

Is the facility located on Indian lands? [ ] YES [X] NO

EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
N OH0000442	9 P 0204010171

B. UIC (Underground Injection of Fluids)	E. OTHER (specify)
U	9 (specify)

C. RCRA (Hazardous Wastes)	E. OTHER (specify)
R	9 (specify)

MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

. NATURE OF BUSINESS (provide a brief description)

Extrusion of nonferrous metals.

II. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Richard J. Gerardy Vice President - Engineering	R J Gerardy	[illegible]

COMMENTS FOR OFFICIAL USE ONLY

Form 3510-1 (6-80) REVERSE

Please print or type in the unshaded areas only (fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE PERMIT APPLICATION
Consolidated Permits Program
(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F OHD980683544 1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

X 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

☐ 2. NEW FACILITY *(Complete item below.)*

C 8 | YR. 62 | MO. 01 | DAY 18 — FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

YR. | MO. | DAY — FOR NEW FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

☐ 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER (barrel, drum, etc.)	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET (the volume that would cover one acre to a depth of one foot) OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER (Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE	UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G	LITERS PER DAY	V	ACRE-FEET	A
LITERS	L	TONS PER HOUR	D	HECTARE-METER	F
CUBIC YARDS	Y	METRIC TONS PER HOUR	W	ACRES	B
CUBIC METERS	C	GALLONS PER HOUR	E	HECTARES	Q
GALLONS PER DAY	U	LITERS PER HOUR	H		

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. 1. AMOUNT (specify)	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. 1. AMOUNT	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5				
X-2	T 0 3	20	E		6				
1	S 0 1	6,000	G		7				
2					8				
3					9				
4					10				

ontinued from the front.

I. PROCESSES (continued)

SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

V. DESCRIPTION OF HAZARDOUS WASTES

. EPA HAZARDOUS WASTE NUMBER — Enter the four-digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four-digit number(s) from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

). PROCESSES

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in column A select the code(s) from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

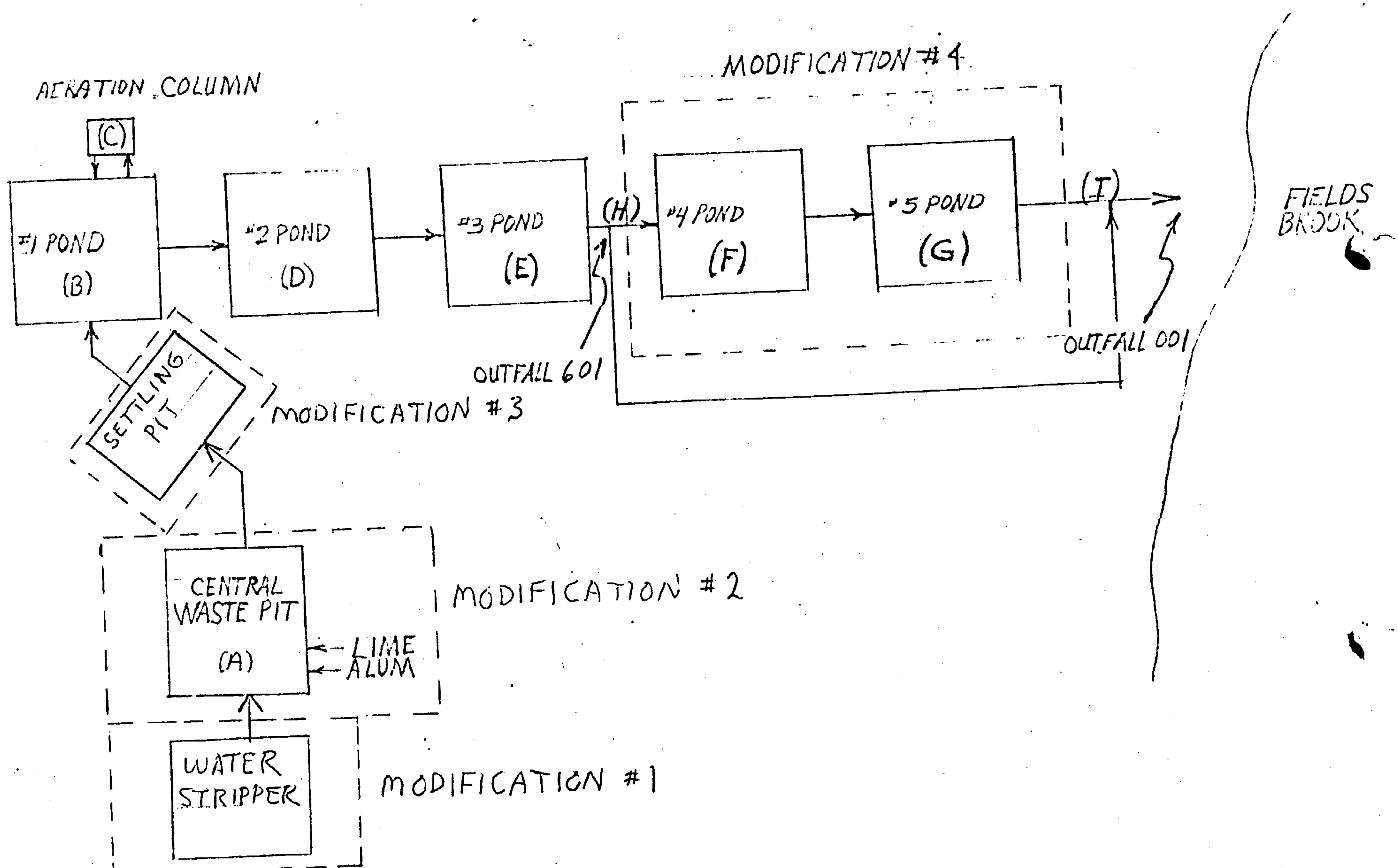
2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

IOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

:XAMPLE FOR COMPLETING ITEM IV (shown in line numbers X-1, X-2, X-3, and X-4 below) — A facility will treat and dispose of an estimated 900 pounds er year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes re corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 00 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
X-	0 5 4	900	P	T 0 3 D 8 0	
X-2	D 0 0 2	400	P	T 0 3 D 8 0	



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